THE

JOURNAL OF THE SOCIETY OF ARTS,

AND OF THE

INSTITUTIONS IN UNION.

VOLUME XIV.

FROM NOVEMBER 17, 1865, TO NOVEMBER 16, 1866.

LONDON:

PUBLISHED FOR THE SOCIETY BY BELL AND DALDY, 186, FLEET-STREET.

1866.

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112TH SESSION.] FRIDAY, NOVEMBER 17, 1865. [No. 678. VOL. XIV.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday evening, at Eight o'clock:—

NOVEMBER 22.—"On Water Supply, especially in Rural Parishes and Districts." By J. BAILEY DENTON, Esq.

NOVEMBER 29.—"On the Proposed Purchase of Railways by the Government." By WILLIAM HAWES, Esq., F.G.S.

DECEMBER 6.—"On the Graphotype, a Process for producing from Drawings, Blocks for Surface Printing." By HENRY FITZ-COOK, Esq.

DECEMBER 13.—"On London Milk." By J. CHALMERS MORTON, Esq.

DECEMBER 20.—"On Parkesine, its Composition, Manufacture, and Uses. By OWEN ROWLAND, Esq.

CANTOR LECTURES.

The Cantor Lectures for the present Session will consist of Three Courses, to be delivered by G. W. HASTINGS, Esq., LL.D., Barrister-at-law; FLEEMING JENKIN, Esq., F.R.S.; and Dr. F. CRACE CALVERT, F.R.S.

The following are the particulars of Mr. Hastings's course:—

LECTURE I.—MONDAY, NOVEMBER 27TH.—"The Effects of the Discovery of the Precious Metals on the Ancient Civilisation of the Mediterranean."

LECTURE II.—MONDAY, DECEMBER 4TH.—"The Effects of the Discovery of the Precious Metals on Modern Civilisation.

LECTURE III.—MONDAY, DECEMBER 11TH.—"On Copyright."

LECTURE IV.—MONDAY, DECEMBER 18TH.—"On Limited Liability."

The other courses will be "On Submarine Telegraphy," by Mr. Fleeming Jenkin, and "On Novel Applications of Chemistry to the Arts," by Dr. F. Crace Calvert.

The lectures will commence each evening at *Eight* o'clock, and are open to Members, each of whom has the privilege of introducing ONE Friend to each Lecture. For this purpose a set of tickets for Mr. Hastings's course is forwarded to each member with this number of the *Journal*.

Proceedings of the Society.

FIRST ORDINARY MEETING.

Wednesday, November 15th, 1865; William Hawes, Esq., F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Angier, Frederick J., 12, George-yard, Lombard-street, E.C.
Armstrong, Robert, Union Dock, Limehouse, E.
Arnold, Frederick, 4, Mountfort-terrace, Barnsbury-park, N.
Beattie, Joseph Hamilton, 11, Dowgate-hill, E.C.
Bennett, Solomon, 111, Richmond-road, Hackney, N.E.
Brown, Andrew Betts, Vauxhall Iron Works, Wandsworth-road, S.W.
Carloss, W. I., 66, Hatton-garden, E.C.
Cooke, Lieut.-Colonel A. C., R.E., 95, Mount-street, Grosvenor-square, W.
D'Andrade, A. de Carvalho Paes, 34, Darnley-crescent, Hackney, N.E.
Denman, The Hon. George, Q.C., M.P., 1, Tanfield-court, Temple, E.C.
Denoon, Alexander, 8, Marlborough-road, St. John's-wood, N.W.
Devonshire, F. H., 1, Frederick's-place, Old Jewry, E.C.
Do Nascimento, J. C. F., 34, Darnley-crescent, Hackney, N.E.
Dufrené, Hector Auguste, 10, Rue de la Fidelité, Paris.
Dyball, Sextus, 18, Bucklersbury, E.C.
Fairlie, Fobert F., 56, Gracechurch-street, E.C.
Foster, Thomas Campbell, 2, Plowden-buildings, Temple, E.C.
Gray, Thomas, 7, Mincing-lane, E.C.
Greene, Matthew, 9, Gracechurch-street, E.C.
Hall, John, jun., 1, New London-street, E.C.
Henwood, Charles F., 4, Avenue, East India Chambers, Leadenhall-street, E.C.
Hill, Henry, 38, Bow-lane, E.C.
Holmes, William, 36, Basinghall-street, E.C.
Lepard, S., 127, Kennington Park-road, S.
Lutwyche, William, 224, Queen's-road, Dalston, N.E.
Moore, Alfred, Fitzroy-house, Bradmore-villas, Hammersmith, W.
Mountain, Charles G., Suffolk Works, Berkeley-street, Birmingham.
Nathan, Samuel L., 6, John-street, Bedford-row, W.C.
Newby, Edwin H., 31, Cheapside, E.C.
Nixon, Edwin, 2, Kennington-green, Lambeth, S.
Parkes, John T., Smethwick, near Birmingham.
Phillips, Thomas, 27, Beacon-hill, Holloway, N.
Prentis, Charles, 245, Marylebone-road, N.W.
Richardson, James N., jun., Bessbrook, Newry.
Smith, Edward, 5, Crown-office-row, Temple, E.C.
Silk, G. C., Vicarage, Kensington. W.
Stewart, Alexander Y., Apothecaries' Hall, Water-lane, E.C.
Thomas, Frederick, 72, Bishopsgate-street Within, E.C.
Treble, George, jun., 42, Gloucester-street, Hoxton, N.
Vavasour, William, Clifford Hall, Finchley, N.
Waring, Charles, 5, Victoria-street, Westminster, S.W.
Whitmarsh, William M., M.D., Hounslow, W.
Wildy, Augustus, 11, Queen's-terrace, Regent's-park, N.W.
Williams, Frederick, M.P., Gonvrae, near Truro.

The CHAIRMAN delivered the following

ADDRESS.

Through the kindness of my colleagues on the Council I have the honour to deliver the opening address of this, the 112th, session of the Society.

I feel, in submitting to you the evidence that the Council has faithfully discharged its duty to the Society, and has fulfilled its obligations to the public, I am, on the third occasion of my addressing you, placed in rather an embarrassing position, for I fear that in claiming merit for the Society's proceedings during the past two years I may be considered as attributing to myself an undue portion of the honour which belongs exclusively to the Council and to the Society, the result of whose exertions I am proud to record. Let me, then, say that I believe no society can be served by a council more anxious to promote the objects for which it is elected, nor can any council receive more able, earnest, and zealous support from its officers than is received by the Council of this Society.

My first duty in this address, following the course usually adopted, is to pay a tribute of respect to the memories of the distinguished members whose loss the Society has to deplore during the past year.

In the Earl of Carlisle the Society and the country have lost a nobleman distinguished by his highly-cultivated mind, by his refined taste, by his eminence as a statesman, and by his desire at all times to support and to promote everything tending to encourage the purest taste in his own class, and the greatest improvement attainable by every other class of society.

In Mr. Gregson, Member of Parliament for the borough of Lancaster, the Society has lost an active friend, who never failed when required to give the Council the benefit of his advice and influence.

In Art a distinguished painter has passed from our list of members, Mr. David Roberts commenced life, like several of our great artists, as a scene painter and rose rapidly to distinction. His art can scarcely be termed landscape. It was confined to picturesque architecture; and from first to last the composition of his easel pictures, their treatment, and the groups with which they were filled, were essentially scenic. In this style he was highly distinguished, and became very popular, but he was better known and more appreciated by the publication of his sketches in Egypt, Syria, and the Holy Land. He was a member of the Royal Academy, and a large contributor to their exhibitions, and was for some time an active member of this Society's Council.

From our list of mechanicians we have lost Mr. John Fowler, the inventor of the steam plough; Mr. Neilson, the inventor of the hot blast as applied to the manufacture of iron; Mr. Chance, a very distinguished glass manufacturer; and Mr. Appold, a most ingenious engineer, whose name will be long associated with the centrifugal pump.

Besides these the Society has lost, in Mr. Cassell, a member whose time and energy were exclusively devoted to the production of a new and greatly-improved literature for the people. The revolution he produced in the description of works compiled and published for the working classes entitles him to the character of one of their best friends. The skill with which he united amusement and instruction in all his publications — the judgment with which he selected classical works suited to the taste of his readers, and reproduced them, admirably illustrated, at a price hitherto unknown, making them as popular with, as accessible to, the people —secured for them a sale in unprecedented numbers. Mr. Cassell began life in Manchester, as a working carpenter, but throwing himself heartily, at an early age, into the temperance movement, he soon became a writer in the publications issued by that body, then a publisher of their tracts, and terminated his useful life as the senior partner in a house the extent of whose transactions in literature for the people has never before been approached. Mr. Cassell was undoubtedly a great benefactor of his country, and most richly deserves notice by this Society. It will, no doubt, interest many to hear the list of works he reproduced in that cheap and tasteful form which specially suited them to the wants and means of his readers. His first important publication, "The Working Man's Friend," was issued in 1850, after which there followed in succession the "Popular Educator" (of which 300,000 copies have been issued), the "Illustrated Family Paper" (which is still published weekly), the "History of England" (the circulation of which has reached 500,000), the "Illustrated Family Bible" (of which above 350,000 copies have been sold), "Natural History," the "Bible Dictionary," "Bunyan's Pilgrim's Progress and Holy War," "Robinson Crusoe," Goldsmith's works, Shakespeare, "Gulliver's Travels," "Don Quixote," "Fox's Book of Martyrs;" and the "Quiver," a magazine for Sunday reading, has attained a weekly circulation of 100,000 copies.

In addition to these losses the Society has also been deprived of a Member of Council, Mr. Thomas Winkworth, who, for nearly forty years, took an active and prominent part in all its business, and was distinguished by his steady support of every measure calculated to promote the popular advancement of Arts and Manufactures. Connected with the silk trade, a branch of industry which was among the first to be exposed to foreign competition by the removal by

Mr. Huskisson of a portion of the prohibitory duties which then checked improvement at home and excluded our manufacturers from foreign trade, he, in opposition to the opinions of the majority of his brother manufacturers, at once adopted and supported the liberal policy of Mr. Huskisson; and, advancing as inquiry and the accumulation of facts developed its greatness and importance, he became not only a free-trader in his own manufacture, but an ardent supporter of free-trade principles in their broadest application to the trade and commerce of the country. These views led him, as a member of Council, in 1849, to support the proposed Exhibition of 1851, when it was limited to the productions of this country and its colonies, and he was among the earliest of the members of the Council cordially to support the great idea of His Royal Highness the Prince Consort for converting the National Exhibition into an International Exhibition of the productions of all Nations. Mr. Winkworth had great faith in the advantages to be derived by workmen, and art workmen in particular, from industrial exhibitions, and he was a subscriber to, and guarantor for, several of them. In Mr. Winkworth the Society has lost one of its oldest and most active members.

In addition to this list of members I must notice the death of Dr. Lindley, F.R.S., a most distinguished botanist, and formerly examiner in botany to the Society. Though not on the list of its members, he entered heartily into its educational plans, from the first establishment of examinations, and, with many other professors, gave his time for some years gratuitously. He was a zealous worker in the Exhibition of 1851 and in that of 1862, in which he had the entire charge of the Colonial department.

I will now call your attention to the proceedings of the Society during the past year, and show by what means we hope to promote its objects in the coming session.

I will first refer to the special committees appointed, two of which in particular occupied much of the time and attention not only of the Council but of other members of the Society who kindly assisted in the inquiries to which they were directed.

The Committee on Musical Education, presided over by Mr. Cole, has already made considerable progress in the inquiry entrusted to its care. It has collected very valuable information from the Chairman of the Committee of Management of the Royal Academy of Music, as well as from the Principal and others well informed on the subject, and, by the kindness of Earl Russell has been enabled, through the Foreign Office, to obtain accurate and official accounts of the practical working of the various Academies and Musical Institutions abroad. The evidence taken has been published in the *Journal*, and among the members as well as the musical profession, has been the means of awakening attention to the subject, all parties agreeing that England ought not to be behind France and other countries of Europe in musical art.

Its inquiries will be renewed in the coming session, and I have confidence that public advantage will arise from them. So far as the inquiry has gone it has shown that whilst large funds are devoted to the encouragement of the study and practice of music, the result, from the number and diversity of the channels through which they pass, is entirely unsatisfactory, and that the administration of the Royal Academy requires amendment, for which that Institution itself is anxious.

The best mode of appropriating these funds, so as to produce the greatest effect on the musical education of the country, is a very large and very important question, and especially deserves the attention of this Society, for if the love and practice of music can be disseminated among the people here as it is abroad, they will contribute materially to raise the mental and moral status of our population, for no means will so effectually aid in checking the habitual resort to the public-house as a place of amusement, as local gatherings in villages and country districts for the enjoyment of vocal and instrumental music, preceded, as they must be, by many and frequent minor meetings and friendly associations for instruction and practice.

The second Special Committee, which was appointed to inquire whether anything could be done, by legislation or otherwise, to remedy or to mitigate the evils arising from the want of proper dwellings for the labouring classes, completed its inquiry and published its report in our *Journal*, No. 651, May 12. The resolutions adopted by this Committee, and the recommendations based upon them, did not, I fear, entirely satisfy those who promoted its appointment, for it was proved that but little could be done, either by the legislature or by individuals, immediately to remove or materially to mitigate the evils universally admitted to exist, but unfortunately inseparable from, the crowded streets and houses in which by far the largest proportion of our working classes are obliged to live. But, as a means of assisting those who are devoting a great deal of time to the removal of many of the moral and social evils incidental to this overcrowding, and who have expended large sums in providing improved dwellings for the industrious classes, the Committee recommended the Council to publish a Hand-book, pointing out the means by which nuisances arising from overcrowded lodging-houses, want of water, bad drainage, noisome works, &c., &c., may be re-

moved. This little work, which has been prepared by Mr. Ware, who ably discharged the duty of Reporter to the Committee, will soon be published, and will contain references to all the Acts of Parliament on the subject, and will point out how individuals or societies may proceed to enforce by law the removal of nuisances which are now tolerated, to the injury of public health, but to the pecuniary benefit of the owners of house property of the worst description, only because no one knows how to bring into operation the provisions of the numerous Acts of Parliament relating to them. The Committee believe that if the provisions of these Acts are enforced, the miserable but very profitable trade which now exists in overcrowded lodging-houses—where vice and immorality of all kinds are fostered and maintained—will gradually be eradicated, and those who now inhabit such houses will be obliged to seek less crowded, more healthful, and less vicious lodgings—the operation of which change upon labourers' dwellings in general, will be to raise the standard of accommodation to all, to the great benefit of morality and public health.

This change, however, must be a work of time, and all the Committee can hope for, as the result of their labours, is, that with this "Handbook of Sanitary Law" before them, many individuals and societies will attack the overcrowded, ill-drained, ill-ventilated lodging-houses, so as to restrict the number of their inhabitants, and secure improved ventilation and drainage, whereby much disease, vice, and misery will be prevented.

The general business of the Society during the past year has been, I think, of rather more than an ordinarily useful and interesting character.

Its proceedings with reference to Education and the system of voluntary examination, established in 1856, have been so fully explained at our previous meetings, that they require no other notice from me than to record their progressive advance in public estimation. It is necessary, however, when considering the figures I shall place before you, to recollect the greatly increased facilities for obtaining education, and for testing, by examination, the extent and soundness of that education, which now exist, compared with those accessible to the artizan and middle class when the Society first stepped forward to afford to all who desired it a public acknowledgment of their industry and knowledge.

The papers distributed by the Society, through the Institutions in Union with it, prepared the way for the success of the Oxford and Cambridge middle-class examinations, and for those more particularly adapted to artizans, conducted by the Department of Science and Art. Neither of these bodies, however, occupy the place specially filled by our Society. The University Examinations test the proficiency and acquired knowledge of those who in most cases have had the advantage of careful teaching, and who have been able to devote several years exclusively to education. The advantage thus offered by the Universities to the scholars and teachers is of the greatest value. It has introduced a spirit of emulation between schools as well as between pupils, and henceforth the number of pupils who succeed in this examination will form an important element in the considerations which determine parents in the selection of schools for their children.

The Science and Art Department commences its examinations at a very early age, and thus prepares its pupils for more severe examinations at a later period; whereas our Society is the only body which offers means of testing knowledge in most cases acquired in leisure time without the aid of teachers, and after the work of the day has been completed—to those, in fact, who have not had the advantage of a preliminary school education and training, nor of attending in early life the teaching of the Department of Science and Art.

It is to me, then, most satisfactory to be able to report, notwithstanding the large numbers examined by the two public bodies I have referred to, that the number of those submitting to the stringent examination of the very able professors and others who undertake this duty for the Society annually increases, and that the papers, including some of the elementary branches of Mechanics, English History, Chemistry, Physiology, and Music have, on the whole, been very satisfactorily worked.

The number of students examined in 1865 was 1,199, against 1,068 in 1864; and the number of papers worked was 1,744, against 1,540.

The Prince Consort's prize has this year been awarded to Mr. Thomas Healey, of the Burnley Mechanics' Institution, who, in the present and the three preceding years, obtained no less than eight first-class certificates with six prizes.

The Cantor Lectures were as successful as in the previous year, and attracted crowded meetings of our members, and I am happy to be able to announce that we have made arrangements for three courses to be delivered during the coming season. The first course, to commence November 27, will be by Mr. G. W. Hastings, LL.D., whose opening lecture will be "On the Effects of the Discovery of the Precious Metals on the Ancient Civilisation of the Mediterranean." For the subjects of the remainder of this course I must refer you to the announcement in the *Journal*. The second course will be given by Mr. Fleeming Jenkin, F.R.S., on "Submarine Telegraphy;" and the third by

Mr. Crace Calvert, F.R.S., on "Novel Applications of Chemistry to the Arts."

Several of the Papers read at our weekly meetings last season were of considerable merit. I will refer particularly to that by Mr. Morton, on the "Application of Sewage;" to that by Mr. Wm. Stones, on "Colonization;" and to that by Mr. Coleman, on "The Food of Animals," for each of which the Society awarded its medal; and also to the papers by Mr. Burnell, on the "Municipal Organisation of Paris with respect to Public Works;" by Mr. John Bell, on "Window Horticulture;" by Captain Selwyn, on the "Art of Laying Submarine Telegraph Cables;" and especially to Mr. Steet's paper on "The Preservation of Food." This paper contained much useful and practical information on a subject of great moment at the present time, and I will avail myself of the opportunity this notice of Mr. Steet's paper affords me to call your attention to what the Society has in past times done to promote the supply of animal food from foreign countries for the use more particularly of our working population.

The Society from its earliest foundation directed its attention to the encouragement of the breeding of cattle and sheep; and I have, with the assistance of Mr. Davenport, found one paper among others, from which I hope it will not be uninteresting to read some extracts.

This paper, written by Mr. Dossie, a member of the then acting committee of the Society, was printed in 1771. It is entitled a paper on "*The Murrain or Pestilential Disease which appeared among our Cattle in* 1769-70, *and on the Methods of preventing Infection, and on the Medicinal Treatment of Beasts seized with it*," which appear as applicable now as they then were.

After observations on the liability of cattle and sheep to disease, the writer says, "There is, however, a disease incidental to neat cattle, which, propagating itself by infection, raging at times in most countries in Europe, and carrying destruction wherever it comes, that it may truly be called a pestilence, has in its turn visited our island and made us experimentally sensible of its dreadful consequences. It prevails with great malignity at this time on the shores of the Continent opposite to us, whence some sparks of the contagion have been lately brought and kindled here in more than one place, as is imagined;" and he continues, "It is, indeed, only under particular circumstances, as will be shown, that cattle are susceptible of this infection, because when most diffused over the country it extinguishes entirely of itself in favourable periods when the general state of animals is healthful, as we have twice experienced in the present century. But the irregularity of the late seasons, and particularly the great alternations of heat and cold, the continuance of wet weather, and the frequency of easterly winds, all of which are injurious to animal strength, and conspiring in this year, have manifestly weakened both vegetables and animals, have consequently rendered the cattle peculiarly susceptible of this infection, as well as mankind to those infectious distempers to which they are subject." * * * The writer then continues, "The effects of the contagion were (at first) confined to a few beasts. But it is to be apprehended, from the increased disposition of cattle to receive it in consequence of the unfavourable circumstances of the season, we have most mischievous consequences to dread from the infection if again introduced; and whoever will examine well the orders and regulations of the Government, made to hinder the spreading of the contagion, will find we can have little dependence upon them for our security against this momentous evil."

The writer then proceeds to investigate the causes of this distemper—the manner in which its contagion acts—the symptomatic appearances it exhibits—and the mode and success of the trials made to prevent infection and to cure the disease. He says, "many voluntary writers have published treatises on this subject, and professors of physic and academic bodies have been called upon by the authority of several governments to deliver their opinions upon it; but little success to practical utility has resulted from such labours."

He then endeavours to supply the information which was wanting, but this I cannot extract, though I hope the more important portions of this valuable paper will be hereafter given in our *Journal*.

By the historical notice of the disease we find that it appeared in the eighteenth century, in 1710 and 1711, when it was first observed in Hungary; from thence it went to Dalmatia, to Padua, and, spreading over the Venetian states, was disseminated through the whole of Italy, and passed, in 1713, to Germany by the Tyrol, from whence it was communicated north to Denmark and Sweden, introducing itself about the same time into Great Britain. After this, under the influence of more favourable seasons, the contagion abated, and in about nine years the infection seemed exterminated in most of these countries. About 1730 the disease appeared again, but the infection was soon extinguished; regulations by the Government were issued for its suppression. In 1740-41 it broke out in the south-east of Europe, and made its way as before, having been brought thither, it was believed, from Holland, and caused great devastation of the cattle for several years. In 1756 it raged with great

violence for some time, when it gradually abated, and, as far as it appeared, the infection was wholly lost, and did not reappear till the autumn of 1768, when it broke out afresh in two or three places, not, there is reason to believe, from the relics of the former contagion, but by new contagion brought from foreign parts, for while England was free from it for several years, it visited other places, Denmark and Jutland in particular, where it was more severe than had ever before been known.

From the result of careful inquiry during the latter invasion of the disease in several parts of Europe, the following observations were made:—

1. The infection of this disease prevails only at particular times anywhere; acts with greater violence at some times and some places than at others; affects only part of the cattle anywhere, and those with various degrees of malignity.

2. That where the infection does not subsist, it never comes but after some general cause has weakened the habit of the beasts in general—such as severe cold; want of sufficient and wholesome food; repeated alternations of heat and cold; moist air, replete with putrid vapours; long-continuance of easterly winds; or, what is more frequent, the combination of two or more of these causes. Thus, he adds, we find contagion invading every part of Europe in 1701, when the season had been so inclement the year before as to destroy a great part of the sheep in England. In 1741, when, after a very intense frost from December to April, by the rigour of cold and the scarcity of fodder the cattle had been reduced to a debilitated state aggravated by the constant easterly wind of the summer and autumn following.

I cannot follow all the remarks upon the principles which the writer believes affect contagion generally, but he asserts that the weaker animals are first and most severely attacked, and more frequently die under it; and he gives as the result of his inquiry that, though infection is the efficient cause of the murrain in cattle, yet there is a predisposing cause or particular state absolutely necessary to its acting or taking effect, and after inquiring into the causes of these predisposing conditions, he states his conclusions to be—

1. That the murrain is communicated by transmission of contagious matter from infected to sound beasts, and that it is only in this way the disease is spread.

2. That it is never communicated through the air.

3. That the contagious matter retains its power a considerable time.

4. That the infection will generally be exhibited in a few days; in a few cases it may not show itself for six or seven, and that after ten days there is no fear of the disease.

5. That the separation of cattle to prevent or to ascertain the existence of contagion need not in any case exceed fourteen days.

Mr. Dossie then enters at great length into a minute examination of the symptoms and treatment of the disease, and examines in detail the various modes of treatment to prevent it, and to cure it after it has appeared, which have been practised in England and foreign countries. He concludes by saying, "But alike has been the success of all the proposed remedies of these several classes, which is, that a remarkably greater number of the beasts to which they have been administered have died in proportion to that of those who have been left to nature."

The cause of this he carefully examines and says:—"The inefficiency of the supposed remedies for the murrain is less to be regretted because a great part of them would be attended with such expense and trouble as would render their general use inexpedient. Whatever method of cure is proposed to be serviceable must be practicable, with a moderate share of trouble and expense."

The symptoms of the disease and its progress in every stage and the appearance after death are next described, and he concludes thus:—"Hence it follows that the way to assist nature against attacks of this disease is to keep up the animal strength by such invigorating means as are compatible, in other respects, with a salutary economy," and he recommends, as best suited for this purpose, "astringent, febrifuge, gummous parts of vegetables, and vinous liquors," and explains by what means these remedies are to be applied so as to bring them within reasonable cost.

The rest of the paper is devoted to the examination of the Orders in Council, and the means recommended for preventing contagion, and in order to insure that the importance of the question may be fully appreciated, a statement is added, extracted from the statistical records of North and South Holland, of the loss of cattle in the twelve months commencing April 1st, 1769:—

Cattle infected	221,119
Died of disease	159,128
Cattle infected in the summer months, from April 1, to September 30, 1769	86,423
Died	63,181
Cattle infected in the winter season, from Oct. 1, 1796, to April 30, 1770	134,696
Died	95,497

And the total number estimated to have died in all the united provinces was above 300,000.

The paper then concludes with these words:—"It behoves every individual, according to his situation, to do his utmost to avert this impending danger, one of the most heavy calamities which can befal any European country, and

especially England, where the luxurious habits of the common people, and the difficulty of obtaining a supply of cattle from other places, and the high prices of the necessaries of life, would render a scarcity of horned beasts, and consequently of all other provisions, peculiarly grievous and intolerable."

If this would have been so 100 years ago, what would be the calamity of such a loss of cattle now? We could hardly look at the prospect which awaits us without the deepest anxiety, did we not feel assured that every possible precautionary measure is being taken by the Government, and more particularly by the owners of cattle to prevent infection from spreading, and to maintain our stock in the best possible condition, though at the same time we cannot but be sensible that an unreasonable fear of infection may produce a more serious effect on the supply of food next year, or even the year after, than the loss of cattle by disease this year. The importance of this subject leads me, however, to the consideration of the question whether, even in ordinary times, those on whom we rely for the production of our food are using the land entrusted to their care so as to secure for the dense population of these islands the greatest and cheapest supply of animal food. Although I have scarcely a right, from my want of practical knowledge, to say a word on this subject, I cannot refrain from suggesting that whilst we have the best and cheapest means at command to obtain whatever corn and other cereals we require from all parts of the world, our means of obtaining any important supply of animal food from foreign countries are very limited and most unsatisfactory, for I find in Mr. Steet's paper that whereas in 1853 we imported 125,253 beasts and 232,037 sheep, we only imported 150,838 beasts and 433,733 sheep in 1863, the one quantity being a little more than six months' and the other scarcely three months' consumption of London. It appears, therefore, looking to these facts, that greater attention should be devoted to the production in these islands of animal food than to that of vegetable food; and I am assured by those on whose knowledge and practical skill I can rely, that although to increase materially our supply of cattle and sheep would require some change in the present mode of cultivating our land, still that the land so cultivated would employ more agricultural labour, more capital in farming, and be more profitable than under the present system, which appropriates so large a portion of our soil to the cultivation of cereals, which can be produced cheaper abroad, to the neglect of the breeding of sheep and cattle, which can only be produced in the numbers we require at home. It appears to me that the people of this country are as yet only deriving a portion of the benefit they ought to receive from free-trade in agricultural products, and that until all parties, landlords and tenants, co-operate with a determination to produce the largest quantity and the best quality of animal food, we shall be exposed in ordinary times to a gradual but certain augmentation of its price as our population increases, and at intervals, when disease attacks sheep and cattle, to prices so high as to take it out of the reach of the great body of the people, and thereby seriously injure the health and productive power of the nation, and materially increase the liability of our population to the ravages of disease.

From the period when Mr. Dossie's paper was written, 1771, to the present time, our Society has frequently offered prizes to encourage improvements in breeding and rearing cattle and sheep; and it will be in the recollection of the members that for the last two years Sir Walter Trevelyan has offered, through the Society, a prize of £70, to which the Council added the gold medal of the Society, for the best method of preserving meat, so that the large quantity now wasted in Australia and South America, and in other foreign countries, may be made available for consumption here. Several applications have been made to the Council for the award of this prize and medal, but no one has yet introduced a new process so successfully as to justify the Council in awarding either the one or the other; but, from information we have received, it seems likely that both will be claimed by Mr. Morgan, of Dublin, who read a very interesting paper on his new mode of curing meat in the season 1864. He had then imported a few samples of beef, cured by his process in South America, but from various causes, although much of the meat was sound, it did not arrive in a sufficiently satisfactory condition to justify, in the opinion of the Council, the award of the prize.

This year, however, Mr. Morgan appears to have taken energetic measures to secure a supply of the best cattle, and that great care should be taken not only in curing, but in packing and shipping the meat, and two large consignments of this meat are shipped, one of which has already arrived, and is now waiting inspection by the Society. Inquiry into the merits of the various plans proposed for preserving meat will form an important part of the duty of the Council in the ensuing session.

I cannot pass from this very interesting subject without directing the attention of the Society to the great want, at a period like the present, when our cattle are being attacked by a most fatal disease, of properly authenticated agricultural statistics. Serious as the loss of cattle from the ravages of the murrain may be, its amount is sure to be exaggerated, and the price of meat unduly enhanced, for the want of ac-

curate knowledge of its extent and progress. Every one is considering how this pestilence can be stayed, how the cattle attacked can be saved, and how we can best recover the loss which is sure to take place, so as to provide sufficient animal food for our population. But unfortunately we are without any means of obtaining reliable information by which these facts can be accurately ascertained, for surely, had we accurate information, we should not hear of cattle being destroyed by thousands in an ignorant panic of fear of infection. We have every return that can be desired of the quantity and quality of every article imported and exported, and of our mineral products, but we have no returns relating to our agricultural productions. The appearance of this disease will I hope enforce upon our agriculturists and our members of Parliament the necessity of immediate steps being taken for the annual collection of official returns respecting this all-important branch of our national industry. It will be a great subject for the new Parliament to enter upon, perhaps the only one in connexion with our internal trade which is entirely free from previous legislation, and which is therefore open to the introduction of a system which shall combine with efficiency and simplicity the most perfect returns of every description of produce from the soil of this country.

It is only from the knowledge afforded by official returns that, in times like the present, when a fatal disease suddenly attacks our herds, we can, with sufficient rapidity, introduce economy of consumption and stimulate supply, so as to avoid a scarcity of animal food, any material deficiency in which must be most injurious to the health and prosperity of the nation.

Captain Selwyn's paper, "On the Art of Laying Submarine Cables" also deserves special notice—not to criticise his views, or to enter into any controversy as to the best mode of laying such cables, but to express the interest the Society takes in the progress of the national work of providing telegraphic communication between England and America. We must all hope that the company in whose hands the accomplishment of this difficult but all-important work rests, will not fail to adopt every means to insure success to their next effort, and that no jealousy or rivalry between distinguished electricians, or between officers entrusted with the arduous duty of laying the cable when made, will prevent due weight and consideration being given to every plan which may be proposed to overcome the scientific or physical difficulties which necessarily attend this most interesting undertaking.

The prizes offered last year to art-workmen, for works of art executed by them in their leisure hours were not responded to so extensively as the Council anticipated they would have been, only £274 out of the £500 appropriated by the Society to prizes having been awarded. In order to ascertain the cause of so few specimens being submitted for competition, the Council invited the exhibitors and their friends to a meeting in this room before the works were removed. The meeting was well attended, and the workmen present were consulted as to the reasons which in their opinion operated to prevent a more general response to the offers of the Society. Many suggestions were made, but the only cause assigned to which practical value could be attached was one which it is hardly desirable should cease to exist, viz., the great demand for work and the all but impossibility of the best workmen finding time to execute works of art requiring energy and thought, with uncertain remuneration, after their regular day's work was finished. Still, the general opinion of the meeting was so much in favour of this movement of the Society that a new list of prizes has been issued for this year, the results of which will, as before, be exhibited in this room.

In order, if possible, to extend the beneficial operation of the Society in this direction, and to excite still greater interest among workmen, the Society issued a circular to 50 or 60 of the great Companies in the city of London, asking either for a contribution to the prize fund, or that they should offer a prize for a work of art connected with the industries to which these guilds originally belonged. The value of the prizes, it was suggested, should range from £5 to £30. Few of the Companies took any notice of this communication, and two only, the Salters' Company and the Plasterers' Company, accepted the proposition of the Society.

The Council will not conceal its disappointment at the result of this attempt to interest these wealthy corporations in the progress of art workmanship. They owe their present position in a great degree to the benefactions of citizens whose fortunes were accumulated by the superiority of English over foreign workmen, and it was not unreasonable to expect that they would have co-operated with our Society in its endeavour to secure the full appreciation of the skill of our art-workmen, by the contribution of a small portion of their wealth to encourage those by whose labour and indefatigable perseverance under great difficulties, and with very scant acknowledgment by the public, they now have the gratification of possessing so many works of art, and of enjoying luxuries which are rarely duly appreciated owing to the facility with which they are obtained.

The Council has reappointed the Committee for marking the sites where eminent men were born, lived, and died. It is proposed to do this

by means of suitable tablets, which, if made in terra cotta, will be most durable; it is hoped that several such tablets may be put up; and any members of the Society who may possess information on the subject not generally known, may usefully assist the Committee by communicating with the Secretary.

The subject of the piracy of trade marks is fast becoming one of great importance to the manufacturers of this country, and the Council proposes to appoint a committee to inquire into the practical operation of the existing law, and to consider what improvements can be introduced to increase its efficiency; the committee will communicate with committees already formed with a similar object in the manufacturing districts.

The papers to be read at our Wednesday evening meetings will, I have reason to believe, fully equal those of former years; and I may safely refer you, in proof of this statement, to the list of subjects advertised for the meetings to take place before Christmas.

In my last address I referred to the arrangements which were then in progress for holding an International Exhibition in Dublin, and it is now gratifying to the Council to be able to record that this has been most ably carried out, and that artistically and financially it has been a success.

The International Exhibition to be held in Paris, in 1867, demands special notice by this Society. The scale on which it is designed, the extraordinary character and size of the building in which it will be held, the perfect organisation which is being adopted to secure not only the exhibition of specimens of everything connected with art, manufactures, and commerce, but their exhibition under such favourable circumstances as must secure the best contributions from every part of the world, and certainly from every producer who desires to retain or to obtain a reputation at home or abroad in connection with any branch of art or manufacture, all lead us to expect that a display will be made on this occasion such as has never been equalled in interest or extent. A Royal Commission has been issued by Her Majesty, to superintend the English arrangements. Our Society has the honour of being well represented on that Royal Commission. It is presided over by H.R.H. our President, and several of our Vice-Presidents and members have the honour of being commissioners.

This subject leads to another, of scarcely less interest to the Society, the award by the Council this year of the Albert Gold Medal to H.I.M. the Emperor of the French.

This medal, by the regulations under which it was founded, is to be awarded for distinguished services in promoting Arts, Manufactures, and Commerce; and the Council, in reviewing the claims of many distinguished men, conceived that no individual had by his own acts and power contributed so much to promote all three as the Emperor Napoleon. By the removal of passports in France as regards English subjects, which led to great modifications of the passport systems of other countries; by his relaxation of the French navigation laws; by his powerful support and application of free-trade principles to the commerce between England and France; by his patronage of art; and by the liberal manner in which he is encouraging the proposed great International Exhibition of 1867, he has undoubtedly fulfilled the conditions required for the award of the medal, and rendered it all but impossible for the Council justly to award it otherwise than to His Imperial Majesty; and, in the words of our annual report, which was read to the Society in July last, I have much pleasure in announcing that the medal, having been conveyed to the Emperor by H.R.H. our President, was most graciously received.

And here I must notice an exhibition of a most interesting character, which has not received the attention it deserved. I refer to the Anglo-French Exhibition of Works of Art by English and French workmen at the Crystal Palace. This exhibition, entirely due to the spontaneous exertions of a few working men of both countries, must be looked upon as a remarkable proof of the progress of sound principles among them, and as the best evidence of the extinction of those anti-national prejudices which for so many years prevented both countries from properly appreciating each other's merits.

In my last address I referred to three great public works then in progress in the metropolis —the main-drainage—the Thames embankment —and the metropolitan railways. The main-drainage, designed by, and constructed under the able superintendence of, Mr. Bazalgette, has now been thoroughly tested, and although an important part of the system is yet unfinished— its completion having been delayed by the necessity of carrying it on in conjunction with the Thames embankment, under which the northern low level sewer is to be constructed— we had ample proof during the very high temperature and long-continued drought of the past summer, followed by a most unprecedented downfall of rain, above five inches in three weeks, that the work has most perfectly satisfied every condition imposed on the engineer. The drainage of the high and low districts of the metropolis is perfect, and the river, which was fast becoming a source of disease, is purified.

I cannot enter into a detailed description of the works executed on either side of the river, but I think I may confidently state that every one present at Crossness when the southern system was opened by His Royal Highness our Presi-

dent, was struck with the solidity, simplicity, and vastness of the works and machinery required to throw into the river in a few hours after high-water the whole of the sewage collected from the southern side of the metropolis.

The Thames embankment at the northern side of the river is very much advanced since we last met, and that on the southern side has been begun. The advantage which will be derived from this great work would be comparatively limited were it not for the new streets which are now being formed, and those for which powers will be sought in Parliament during the next session, whereby a spacious thoroughfare will be opened from the Mansion-house to the embankment at Blackfriars, and another from the embankment to Charing-cross, together forming a roadway from east to west worthy of our great city. To these great works I hope Mr. Bazalgette will soon be able to add another, the necessity for which is daily becoming more and more apparent; I mean water-works, sufficient to bring an ample supply of pure water to the metropolis. Considering what has been done at Glasgow, Liverpool, and Manchester, and the sanitary advantages derived from the supply of pure water to those cities, it will indeed be a disgrace to our Board of Works if any unnecessary delay arises in securing similar advantages to the metropolis of the country.

Mr. Bazalgette, by his admirably-conceived plans for the disposal of our sewage, has already done much to drive from among us certain classes of disease. I trust no support or encouragement will be wanting to enable him to complete his sanitary work, and to replace the vast volume of sewage he now carries away by a still larger quantity of pure water.

Our metropolitan railways, above and under ground, have also made great progress since I last had the pleasure of addressing you. In a few years, when the lines now constructing are united, as they will be, with others of a very important character—for which the sanction of Parliament will be sought in the ensuing session,—and are all working in unison, we shall pass to and from the City, east, west, north, and south without the delays and inconveniencies to which all traffic is now subject, and, notwithstanding the apparently great cost of these works, at a charge per mile much below any of the existing means of locomotion. The advantages our system of metropolitan railways will offer to working men will be very great. They will be able to live away from the crowded districts where they now reside, but be nearer to their work, in point of time and fatigue, than they now are, and they will be carried from all parts of London, at a very small cost, to the most rational places of amusement ever provided for the people of any country—to the Crystal Palace on the southern, and to the Alexandra Park and Palace now building on the northern side of the metropolis. Nor must we, when referring to metropolitan railways, omit to notice the terminal buildings at the Victoria and Charing-cross Stations. They are handsome and imposing structures, and Mr. Barry's work at Charing-cross will take a place among our most beautiful buildings.

I cannot dismiss this subject of metropolitan improvements without referring to Mr. Burnell's paper, read on the 22nd of February last, on "The Municipal Organisation of Paris, especially with regard to Public Works," which directed our attention to the manner in which public works are designed and executed in that city.

The improvements in the streets of Paris have been carried out on a large scale with great vigour and with an uniformity of style and architectural beauty which we cannot approach. They are not, however, the acts of the people; they are entirely the work of the government; for although nominally the municipality of Paris has a voice in them, it is the "Prefect" who suggests, lays out, and is responsible for the plans submitted for the approval and sanction of the Emperor.

The reverse is the case with us. Individuals in combination propose, and after having obtained certain powers from Parliament, which are always granted to those who can prove that public advantage will follow the execution of their plans, execute our public works; but when the character of the work is not commercial but sanitary, or it has great public objects, then power is given to our municipal bodies to execute it, but in every case the action, regulated by certain fixed rules sanctioned by Parliament, is entirely independent of the executive government.

We have, then, in Paris and other cities in France great public works undertaken and paid for by the government. In England works of no less magnitude are constructed either by private enterprise or with funds provided specially for these purposes by the people.

If we compare the works in the respective capitals we find in Paris greater uniformity and greater architectural beauty in streets as a whole —though not in particular parts—than with us. We find works executed, not because the people who pay for them demand them, but with the double purpose of embellishment and sanitary improvement, and the political and military control of the city.

But, admiring, as we all must, the new boulevards, the new bridges, the new theatres, the walks in the Bois de Boulogne and other improvements, on which millions have been spent, may we not fairly challenge a comparison with our public works executed in about the

same time, as to their practical utility; will the improvements in Paris afford such economy of time, money, and convenience to all classes, or so good a prospect of improved health, as we shall derive from our metropolitan railways, our Thames embankment, and our main drainage. The improvements in Paris, Mr. Burnell informs us, cost ten to twelve millions sterling. Our English metropolitan improvements will cost little if any less. There is certainly no evidence in Mr. Burnell's paper that economy of construction forms one of the advantages of the Parisian administration.

It is then for the country to consider which organisation is the best, whether the Government, as some now propose, should have the uncontrolled expenditure of this large sum, deciding how and when it shall be spent, or whether the people, knowing what is wanted, what will most contribute to their comfort and well-being and will best repay the outlay, should themselves undertake to execute and to pay for the works required.

Among important metropolitan improvements I must not omit to mention the proposed Central Hall of Arts and Sciences, which will be erected at the north side of the Horticultural Gardens, on ground belonging to the Commissioners of the Exhibition of 1851. The Hall is to accommodate above 5,000 persons, and will be available for the following objects:—For congresses, national and international, for purposes of science and art; for performances of music, vocal and instrumental; for the distribution of prizes by public bodies and societies; for conversaziones of societies established for promoting science and art; for horticultural shows, and for national and international exhibitions of works of art and industry; for exhibitions of pictures, sculpture, &c.; and for any other purpose connected with science and art.

The funds for its erection will be provided, first, by the Commissioners of the Exhibition of 1851, who grant the site, at a nominal rent, for 999 years, the value of which is estimated at £60,000, and also guarantee one-fourth part, or £50,000, towards the cost of the building; and, secondly, £150,000 will be raised by the sale of boxes and seats, to be held for the full term of the lease, £260,000 being the entire estimated cost of the land, building, fittings, &c. The arrangements are at present under the management of a provisional committee, at the head of which is H.R.H. the Prince of Wales, but the management of the hall, when completed, will be vested in a governing body, under the authority of a Royal Charter.

Intimately connected as we are with almost everything calculated to promote the progress of science and art, we cannot but feel interested in the success of this revival of part of the plan of the late Prince Consort to establish a central institution in London for the promotion of scientific and artistic knowledge, as applicable to productive industry.

I must now direct your attention to the new pictures which adorn our walls. They have been presented to the Society by the subscriptions of a number of its members. The designs for them are in fact James Barry's; he left two engravings for the pictures he intended to fill the spaces now occupied by the portraits of Her Majesty and the Royal Princes and Princesses living in 1851, and of H.R.H. the Prince Consort, our late President. In Barry's original design the one space was to have been filled with a portrait of George III. presenting the Charter of Independence to the Judges, and the other with a group of Queen Charlotte surrounded by her family. The artists, Mr. Cope and Mr. Horsley —Mr. Cope having painted the Prince, and Mr. Horsley the Queen—were specially requested to carry out, as nearly as was consistent with the object in view, the intentions of Barry; and the Council hope the subscribers will be fully satisfied with the manner in which each artist has fulfilled his somewhat unusual and difficult task.

In concluding this address I believe I may assure you that the Society is entering upon the 112th Session with every prospect of continued vigour and success. Still the Council must urge upon members the necessity of their co-operation in promoting its objects, either by reading papers at our weekly meetings, or by attending and taking a part in the discussions, or by assisting on committees. Supported as it hitherto has been by the Society, the Council cannot doubt but that year by year a constant accession of members, all animated by a desire to aid in promoting the Arts, Manufactures, and Commerce of our common country, will testify to its prosperity and usefulness.

Vice-Chancellor Sir W. PAGE WOOD, in rising to propose a vote of thanks to the Chairman for his address, said—Mr. Hawes had now been for the third time elected chairman of the Council of this Society. The address they had just heard he thought sufficiently justified the appointment, but they all knew, though scarcely perhaps to their full extent, the very arduous duties that were imposed upon the chairman. He had to devote a very large portion of time throughout the year to the discharge of his duties as chairman, for besides the attendances at the meetings of the Council and committees, which entailed a considerable sacrifice of time to one who had other avocations and duties to attend to, he had to devote a considerable portion of time to the reading of documents and important correspondence; in fact, he had more duties to perform than unpaid functionaries were usually willing to undertake. Those duties had been ably and punctually performed by Mr. Hawes. The address they had listened to was, he thought, extremely satisfactory and encouraging. It was scarcely necessary to comment, as he (the Vice-Chancellor) had done on former occasions, on the great development of the Society of Arts, which,

as they were aware, had taken place since the keen and lively interest taken in it by the lamented Prince Consort. He was old enough to recollect the time when the Society of Arts had dwindled down to a very small body, whose influence was but slight. Now, however, its influence was diffused throughout the length and breadth of the land. The circumstance that no fewer than 1,200 young men took advantage of the Society's examinations showed how largely diffused and highly appreciated were its efforts to promote education. The field before them was still a wide one. The programme just put forth by the chairman was one of peculiar interest and importance. To dilate further upon the subjects introduced by Mr. Hawes in his address would only be to weaken his remarks; but there were two subjects in particular which he (the Vice-Chancellor) could not refrain from pressing upon the attention of the Society. One was the great question of the supply of food—a vital question, and one which, if properly dealt with, could not fail to be productive of real benefit to the community. This Society, by diffusing useful information on this all-important subject, might do much to check that most fatal of all errors—a senseless panic—with reference to the disease which was now raging amongst cattle. It was, moreover, most important that they should, as far as they were able, both as a Society and as individuals, press upon the legislature the very important point alluded to in the chairman's address, that of obtaining correct agricultural statistics. He believed such statistics would do more than anything else to check unreasonable panic and the unfair enhancement of the price of meat which followed such panic. They had before them the fact that, bad as the disease was, the loss produced by it did not exceed 20,000 head of cattle, which, out of a total of 6,000,000 or 7,000,000 constituting the aggregate stock of the country, was not really a very alarming loss, or such as to affect to any appreciable extent the price of meat food in the country. Moreover he felt convinced that if the importance of the subject was pressed upon the legislature, there would no longer remain such a blot upon our institutions as the total absence of correct and reliable information on so vital a subject as the agricultural produce of the country. This was a matter they would do well to bear in mind during the present session. The next great point alluded to in the address was the French Exhibition in 1867, in which we were again to have our powers as a manufacturing nation tested. We might derive great encouragement in this from what had taken place in the past. The interval between 1851 and 1862 was known abroad to have developed our own national industry to such an extent that the French had become seriously alarmed, and the Government had appointed a commission to see what steps could be taken to prevent the danger to French commerce which was to be apprehended from the rapid advance which England had made in certain branches of manufacture, in which the French were supposed to be pre-eminent. On a former occasion, speaking on this subject, he mentioned a conversation he had had with M. Arlès Dufour, an eminent manufacturer of Lyons, and a most enlightened man. The great strides which had been made in this country in manufactures between 1851 and 1862 that gentleman attributed entirely to the exertions made in the cultivation of art in this country, and especially to the schools of design which had been established; he did not attribute it to the employment here of French workmen. Looking at the enormous interests at stake, it behoved us to do our utmost to be prepared for this friendly international contest. Our powers in this respect were much greater now than they were in 1862, owing to the friendly intercourse which had, during the intervening period, been increased between the two countries. The Anglo-French Exhibition which had recently taken place, as alluded to by the chairman, had been most encouraging. The artizans and workmen of the two countries had thus become better acquainted with each other's capabilities, and had met on the most friendly terms. We had every evidence that the Emperor himself honestly desired a free, fair, and open competition; and it would be greatly to our discredit as a nation if we did not more than hold our ground and show that we had made rapid advances from 1862 to 1867. Before sitting down he would touch upon one other amongst the many points of interest brought forward in the address—viz., the question of trade marks. He was glad the chairman had adverted to that subject. It had come before him (the Vice-Chancellor) in his judicial capacity on more than one occasion, and he was anxious to impress upon any committee who might have charge of it the importance of discouraging, as much as possible, that odious and contemptible puffing which now took place through the medium of trade marks. It would be to our credit as a nation, as moralists, and as Christians, if we endeavoured as far as possible to induce, both by example and by precept, abstinence from everything in the shape of falsehood or undue self-laudation in matters of trade; as evidenced by those foolish designations which the legal tribunals were called upon to recognise as trade marks, although they might be ashamed of them. He would not specify the ridiculous names often given to articles, conveying the idea of the greatest superiority, and involving in some cases fanciful description and the most fallacious representations. With cases of absolute fraud the courts knew how to deal; but the legitimate development of art and manufactures was retarded and injured by the endeavours of noisy pretenders to thrust forward unworthy goods which could only bring discredit upon our markets, especially in competition with foreign nations. In conclusion, he would express a hope with reference to another topic not alluded to in the present address, viz., the Patent Law, that something in that direction would be done by the legislature in the present session of Parliament.

The vote of thanks to Mr. Hawes was then put to the meeting by the Vice-Chancellor, and carried by acclamation.

The Chairman said he felt greatly obliged to the Vice-Chancellor for the terms in which he had spoken of the address which he had had the honour as well as the pleasure of reading. The observations that had been offered would stimulate him to, if possible, still further exertions in promoting the objects of the Society. He took the warmest interest in its business, and the subjects which generally engaged its attention were those to which his own tastes naturally directed him. It was his pleasure and privilege to act with a Council the members of which gave the fullest support and assistance to their chairman, and were always willing to take upon themselves their full share of the labours devolving upon them. He begged to express his great gratification at the kind manner in which his efforts to carry on the business of the Society, and to promote its prosperity, had been received by the members.

Proceedings of Institutions.

London Mechanics' Institution.—On Monday evening, the 13th inst., the distribution of prizes and certificates obtained by the members of the Mechanics' Institution, Southampton-buildings, at the last examination of the Society of Arts, took place in the theatre of the institution, Sir Francis Sandford in the chair. The whole of the 12 candidates who passed the examination of the Local Board were successful in the examination of the Society of Arts, and obtained 17 certificates, five first class, eight second, and four third. During the last six years only one candidate who passed the examination of the Local Board had been rejected by the Society of Arts. The subjects for which the certificates were obtained included chemistry, book-keeping, geography,

algebra, arithmetic, geometrical drawing, English literature, writing, shorthand, and needlework. In addition to the 12 candidates who passed the examination of the Society of Arts there were four who obtained certificates from the Metropolitan Association for promoting the Education of Adults, and three who obtained prizes in the institution classes. The chairman, previously to distributing the prizes and certificates, addressed the audience and complimented the London Mechanics' Institution on the successful position it had attained in educating those who attended its classes. The prizes and certificates were then distributed, the successful candidates receiving, in addition to the books and testimonials, a full measure of applause on the part of those present. A vote of thanks to the chairman brought the proceedings to a close.

DUBLIN INTERNATIONAL EXHIBITION.

The ceremonial of closing this Exhibition took place on Thursday, the 9th instant, in the presence of a very large assembly.

At three o'clock the chair was taken by his Grace the Duke of LEINSTER.

Mr. CHARLES E. BAGOT, secretary to the Executive Committee, read the following report of the Executive Committee:—"At the close of the Exhibition it will probably be expected that some account should be given of its fortunes, and of the principal features which have marked its course. The statistics being still incomplete, and time not admitting of their careful analysis, a general summary, with approximate estimates of its results, is all that can now be presented. The enterprise, which has now reached its termination, had no pretensions to cope with the great Exhibitions of London and Paris. Its prototype, and that with which it may most legitimately be contrasted, is the Dargan Exhibition of 1853; and a brief comparison of some of their results will probably be interesting, and will give the best idea of the changes that have taken place in the interval in the commercial relations of the country, as well as in the scope and character of public exhibitions. The extent or space available in both was nearly equal, but it was very differently distributed; in 1853 the number of exhibitors in the British department was 1,566; in 1865 there were only 770. But, on the other hand, we have 1,544 foreign and colonial exhibitors, while only 286 appeared in 1853, and thus the total number of exhibitors shows a considerable excess over those of 1853. The committee were in truth obliged to exclude a great deal of raw produce, and of the coarser and less interesting class of manufactures, in order to make room for our foreign friends, and for the more attractive description of objects, of which a due proportion was, as experience has shown, essential to the success of an exhibition. In 1853 but one colony (besides India) and seven foreign countries were represented. This year twenty-one colonies, exclusive of India, and twenty-one foreign countries have obtained space. The number of works of art exhibited in 1853 was 1,493, while this year they amounted to 2,072. Perhaps the sculpture has been generally regarded as the most striking and marked peculiarity of the Fine Arts Department. It is unquestionably a very remarkable collection—in the number, interest, and value of the works in marble far exceeding that of 1853, and even that of Manchester in 1857, and, indeed, any previous exhibition whatever. The Spanish and Scandinavian artists, whose works have deservedly attracted so much notice in these galleries, were wholly unrepresented in 1853, and the same observation applies to the instructive series of cartoons, as well as to the very numerous illustrations of the art of photography. We are not able to state at present with any precision the value of the contents of the Exhibition. At a rough estimate, the industrial objects may be set down at more than £400,000, and the fine arts at nearly £300,000, making a total value of £700,000. The Exhibition has been open for 159 days and 51 evenings, and the entire number of admissions of every kind has been a little over 900,000, being an average of about 5,000 by day and of 3,000 by night. From the opening, under the distinguished auspices of his Royal Highness the Prince of Wales, the favour of the public has for six months sustained the undertaking with remarkably even tenour, the number of visitors rarely to any great extent rising above or falling below the average. It is true that we have had few adventitious aids to stimulate in any extraordinary degree the public interest or curiosity respecting the Exhibition. For her Majesty's patronage, so graciously extended to us from the commencement, the committee are most grateful, as well as for the presence on the opening day of their Royal Highnesses the Prince of Wales and the Duke of Cambridge; nor should mention be omitted here of the kind support which the undertaking has always received from Earl Russell, her Majesty's Secretary for Foreign Affairs. But with these exceptions the visits of illustrious personages have been few, and the Exhibition has had mainly to rely on its own intrinsic merits, and on the public appreciation of the lessons of industry, skill, and taste which the contents were so well adapted to inculcate. Without the excitement of novelty, which must in some degree have helped Mr. Dargan's Exhibition in 1853, this Exhibition was unaided also by the enthusiasm which was called forth by the peculiar and unprecedented circumstances under which the patriotic spirit of an individual undertook the sole risk and responsibility of so vast an enterprise. In one respect, however, we have been most fortunate. The splendid weather with which we have been blessed throughout the summer, and which continued to cheer us down to the very verge of winter, greatly favoured the Exhibition, and suggested and encouraged a considerable extension of the excursion and return ticket system on the railways hitherto but little developed or tried in Ireland. Notwithstanding the beneficial influences of the season, the causes already noticed are probably sufficient to account for the fact that the number of our visitors was a quarter of a million under those of 1853, and that our total receipts—about £45,000—are considerably under those of 1853, which amounted to £53,000. But although our expenses have been very large, and in some items, such, for instance, as those consequent upon opening in the evenings, were without precedent in 1853, nevertheless, in one particular we have been saved from a most formidable expenditure, which in 1853 converted the not unreasonable hope of profit into a very serious loss. For the Exhibition of that year it was necessary to erect wholly new and special buildings at a net cost of upwards of £40,000, while for the noble and spacious palace in which we are now assembled, erected by the enterprise of a joint-stock company, an equitable rent, moderate indeed when compared with the saving and avoidance of risk to the Exhibition, is all that our friends are chargeable with. It is known that, according to the arrangement with the Winter Garden Company, they released all other parties from liability or guarantee, and advanced the moneys required for our preliminary expenses. Their prospect of a return, and of the payment of their rent, was entirely dependent upon the success of the Exhibition. Under these circumstances, it is with great satisfaction the executive committee are enabled to report so favourably of the pecuniary results. Although not equal to the hopes of the sanguine, they have happily disappointed the fears of the doubtful and the timid; and there is every reason to believe that not only will all expenses be covered, but that the Winter Garden Company will receive—not the whole, but the committee sincerely trust the larger proportion—of the stipulated rent. This, if not a brilliant, is at least a tolerably satisfactory conclusion, especially when it is remembered how many

exhibitions in recent years have failed to pay their expenses. It remains only to express once more the warm thanks of the Executive Committee to the various members of the several committees of advice, to the colonial and foreign committees and agents, for the zealous and valuable services they have rendered, and to the noblemen and gentlemen who have so freely lent precious works of art to add to the attractions of the Exhibition."

The Lord Mayor proposed a vote of thanks to the Executive Committee, which was seconded by the Right Hon. James Whiteside, and for which Mr. F. W. Brady returned thanks on the part of the committee.

Sir Robert Kane moved a vote of thanks to the exhibitors, which was seconded by the Archbishop of Dublin.

Sir Bernard Burke, Ulster King-at-Arms, declared the Exhibition closed.

THE PARIS EXHIBITION OF 1867.

The Minister of Public Instruction has addressed a report to the Emperor, dated November 8, recommending that in the Paris International Exhibition of 1867 there should be a representation of the progress made by the moral and political sciences in France during the last 20 years, by means of a series of reports from eminent men upon the several branches of these subjects.

The Minister's report is as follows:—

"Sire,—The idea of periodical exhibitions is entirely French. It dates from Louis XIV. for the fine arts, from the Revolution for trade; and France, after having given it to the world, has unceasingly enlarged its proportions in order to render it more fruitful.

"As far back as 16 years ago, Sire, you wished to invite all the nations to these grand solemnities.

"It was England that realised this idea, and saw the first International Exhibition.

"The Palace in Hyde-park only received in 1851 objects furnished by nature herself or by human industry. In 1855 the Emperor decided that the two previous French Exhibitions should be united. Art was placed side by side with manufactures.

"Amid the magnificence displayed in London in 1862 it was recognised that the most precious instrument of labour was still man, and that the productive value of the workman would be increased by augmenting his intellectual value. The English Commission created a special class of popular instruction with this same object; the Imperial Commission has just established two.

"But international exhibitions tend to become the complete representation of modern society in all its modes of activity. After having placed art by the side of manufactures, which it embellishes and elevates, your Majesty wished to place pure science near the applications which are only its outward manifestation. While the Emperor directs the study of the questions which will lead to the discovery of that organisation, which, since the destruction of trade corporations, the mercantile world has been constantly seeking, you desire, Sire, that it be demanded of the moral and political sciences what they have produced to ameliorate the state of society, and of French literature what it has done 'to elevate the soul of the nation.'

"The way of realising this idea is simple. Let the Emperor deign to authorise the Minister of Public Instruction to be an Exhibitor. If his productions occupy a small space, under a very modest form, they will none the less attract attention; and I do not hesitate to say that several will survive the triumphs of their more brilliant neighbours, since the one much more than the other expresses the mind of France.

"I have already secured the support of eminent men, who will describe in a series of reports, bearing their signatures, in order that each may have the honour as well as the responsibility of his work,

"1. The progress accomplished in France in the mathematical, physical, and natural sciences during the last 20 years—that is to say, since the era of great exhibitions.

"2. The progress accomplished by the moral and political sciences in their application to the necessities of society.

"3. The part fulfilled by French literature, which should be studied less in point of form, which is the mission of literary criticism, than in its effects upon the general education of the country. At the Exhibition Palace, in the midst of those material products which are a pledge of national welfare, the liberal arts can only enter by showing that they bring to a people not only noble amusement, but moral strength and dignity.

"The Emperor, whose solicitude extends from the simple teaching of the infant school to the highest speculations of science, cannot give a more useful encouragement to the latter than this picture of the efforts, the greatness, and even in certain points the defects of the mind of France.

"If foreign nations thought fit to make a similar examination of themselves, it would no longer only be by the inventions of each that all would profit. By a comparison of the progress accomplished in various parts in scientific and moral order, every people would enter the path of fresh progress, the level of civilisation would rise, and an additional guarantee would be given for the peace of the world.—I am, &c.,

"The Minister of Public Instruction,
"V. Duruy.

"Approved, Napoleon."

Commerce.

Steam and Canvas.—A New York paper speaks of the remarkable decline of sailing power and advance of steam power on the ocean as evidenced by the fact that on one day twenty steamships left that port—two of them for Europe and eighteen for the Southern ports, to aid in the work of reconstruction. It is an evidence, also, of the way in which that country adapts itself to circumstances. Its sailing marine was becoming almost cumbersome. It had not dock and pier room enough to accommodate it; but as one steamship can do more carrying trade than a dozen sailing vessels, in consequence of the rapidity and regularity with which it traverses the ocean, the latter will gradually vanish, and the United States be able to do all the carrying trade they require with half the accommodation at the piers and docks.

Bismuth.—It is stated in the *South Australian Register* of Sept. 27th, that a very promising bismuth mine in Spencer's Gulf is being vigorously worked, and is likely to prove valuable.

Colonies.

Colony of North Australia.—A colonial paper says:—"North Australia is undoubtedly a fine country, but it will be used for nothing but grazing purposes for long years to come, unless capitalists import Asiatic labour, and expend large sums of money in cultivation. This is a matter well worth the consideration of enterprising people in England. They may take North Australia in hand and make something of it at once. If they do not, the development of the country will be slow. Squatters with their flocks and herds will gradually occupy some portion of it, and these, in the course of time, will be followed by settlers able and willing to cultivate the soil."

Sugar in Queensland.—Sugar cultivation seems as attractive as ever in this colony. Every day new land is reported as being taken up under the sugar-growing regulation. The Albert River seems the great point of

attraction. and the operations being carried on are very considerable, a large and profitable return being anticipated. The Colonial Treasurer is about to introduce a bill to legalise the distillation of rum upon sugar-growing estates, the provisions of which, it is fully expected, will secure the planter against the possibility of loss connected with the past year's crops.

Obituary.

CHARLES FRANCOIS NANTEUIL LEBŒUF, a French sculptor, at the age of 73 years. His most celebrated statue is that of the *Dying Eurydice*, now in the gallery of the Luxembourg. The bas-reliefs of the peristyle of the Pantheon, and those of the pediment of the graceful church of St. Vincent de Paul, near the terminus of the Great Northern Railway, are by his hand. M. Lebœuf was a member of the Academy of Beaux Arts, in the Institute of France.

DR. THOMAS HERBERT BARKER, of Bedford, died on the 24th ult., of a severe attack of typhus fever. He was known by his numerous and valuable contributions to the advancement of medical and chirurgical science, for which he had received the Fothergillian and other prizes of the Medical Society of London. He was a fellow of the Royal Society, of the Royal College of Surgeons, and of many other learned and scientific societies both at home and abroad. He took considerable interest in the promotion of education, and acted for some time as honorary local secretary to the Society of Arts, at Bedford.

Publications Issued.

THE ACTS 28 VICTORIÆ, CAP. 3 AND CAP. 6, CONCERNING INVENTIONS AND DESIGNS, EXHIBITED AT THE DUBLIN INTERNATIONAL EXHIBITION, 1865, AND INDUSTRIAL EXHIBITIONS GENERALLY. By F. W. Campin, Esq., Barrister-at-Law. (London: *Stevens, Sons, and Haynes; W. Bilton; E. and F. Spon.* Dublin: *Hodges, Smith, and Co.*)—To this work are appended notes and citations of modern and important cases as to exhibition, publication, and user; also a statement of some principal points in the law and practice of patents, with an appendix, containing the provisions of the Art Copyright Act, 1862, and the Merchandise Marks Act, 1862. The writer hopes that the remarks contained in this work may serve to warn Exhibitors of their real position under the Acts of Parliament therein referred to. The protection afforded by those Acts is so meagre as, in his opinion, to be utterly unreliable. The notes and citations are designed to be useful to the legal profession, as well as to inventors and designers, from presenting in a collected form some recent and important cases referring to Patent Law and Copyright.

SEVEN-FIGURE LOGARITHMS of Numbers from 1 to 108,000, and of Sines, Cosines, Tangents, Cotangents to every 10 seconds of the Quadrant, with a Table of Proportional Parts. By Dr. Ludwig Schrön, Director of the Obervatory of Jena, &c., &c., &c. With a Description of the Tables added by A. De Morgan, Professor of Mathematics in University College, London. (*Williams and Norgate.*)

TRAITE DE L'EXPLOITATION DES CHEMINS DE FER. By Victor Emion, with preface by Jules Favre. (Paris, 2 vols. 18mo.)—A small, but not unimportant work, on a subject that has occupied little attention at present, by an advocate, with a preface by his eminent colleague, M. Jules Favre. The first volume treats of travellers and their luggage, and the second of goods. The object of the work is to make known to the world at large the right of the public as well as the duties of the powerful companies which, to quote the expression of the author, have at the present day the monopoly of transport in their hands. M. Emion takes the traveller by the hand, leads him to the station, takes his ticket, accompanies him on his journey, sees him safe out of the station at the end of his journey, and explains at each step the duties and the rights of the company, discussing all cases of doubt, in fact explaining fully the laws, regulations, jurisprudence, and equity of the railway system. The same is done with reference to baggage and merchandise, the questions of delay, injury and loss being fully explained, as well as the means to be taken by the public and merchants to guard against risks of all kinds; finally, he explains the course to be taken in cases of dispute, and illustrates his subject by reference to actual cases. Such a popular treatise on the practice and law of railways cannot fail to supply many hints for legislative reform.

HABITATIONS OUVRIERES ET AGRICOLES. By Emile Muller, C.E. (Paris. 4to, with atlas, containing forty plates.)—An important work, which has obtained the favourable notice of the Minister of the Interior, and treats of the habitations of the working classes in town and country, of cités ouvrières, or collections of residences, of public baths and washhouses, and other matters connected with the well-being of the people; it is illustrated by plans of each kind of building, details of construction, and the cost in various countries, together with the laws and regulations applying thereto; details concerning contracts, and sanitary regulations. The author gives an account of the results produced in England as well as in various parts of France; together with ministerial reports and accounts of philanthropic associations. The work also treats of mutual building associations, and co-operative societies for the supply of food, baths of all kinds, steam and other methods of washing and drying by means of hot air. Much attention has been paid to these subjects in France during the last few years, and much experience acquired, both by successes and failures. In the exhibition of 1867 a large amount of space will be devoted to these matters, and there is no doubt that the working classes of all countries will benefit by the discussion of the subject, and the practical exhibition of what has been done in various states.

Notes.

CARELESSNESS OF THE PUBLIC.—More than *two million* letters are every year returned to the writers, from some error or other in the directing or posting. Twelve thousand letters or so are posted without any address whatever on the outside; these are opened at St. Martin's-le-Grand as the only course to pursue, and are sent back to the writers. One such letter enclosed paper money to the value of £4,000, which was promptly returned to the sender; and thus ended a double blunder—sending so large a sum by post, and failing to address the letter. Twenty thousand letters or more arrive at the chief office every day without any street or number being written on the outside—simply Mr. So and So, London. Fifty thousand postage stamps are every year found in the letter-bags and boxes, rubbed by friction from the letters and newspapers to which they had been imperfectly cemented. One newspaper in about five thousand slips from its cover through careless fastening, and comes to grief; for the sorters do not know which covers belong to which newspapers. Without noticing the country post-offices, or even the 1,100 receptacles for letters which now exist in the metropolis, City men send to the chief office alone two hundred letters every day, entirely unsealed and unfastened. Some letters have no address either on the inside or outside.—*Literary Magazine.*

CITY HORTICULTURE.—On Tuesday last the Lord Mayor opened a flower show at Guildhall, held under the auspices of the Winter Horticultural Society, which includes amongst its members a large section of our most eminent gardeners and nurserymen. The object of the exhibition was to obtain funds for the relief of

gardeners and nurserymen in calamity, old age, or sickness. A most interesting and beautiful collection of flowers was brought together, and these, with the additional attraction of the decorations of the Guildhall as at the civic banquet, brought a very numerous attendance.

Correspondence.

CARPET DESIGNING.—SIR,—At this season of the year the small carpetmakers of Ooshak, Koolah, Ahiediz, &c., from the great Turkey carpet districts, come up to Smyrna to sell their year's produce of carpets, prayer carpets, rugs, &c., and which they sell to the merchants and private customers. One of these men having a rug with a well balanced pattern, I tried to learn from him who was the designer, but, partly from suspicion, and partly because I could not hit upon the right word in Turkish, he held me at bay for some time, and said that the women of his family did it. At length, in the course of conversation, gaining his confidence more—for he was proud of having served with the English in the Crimea, and of having sent carpets to England—he told me that a dervish was the *mi'mar*, that is "architect." Of course I had tried every artistic word without thinking of that. *Mi'mar* is not a bad word, for the style of this and many of the carpets is that of the arabesque ornaments of the mosques and stained glass, having the characters of a school. I have never yet come across an ecclesiastical *mi'mar*, but I have seen recent works of theirs in decoration, which attest their living taste. I should like to learn more of this decorative school, which showed many interesting works at the Imperial Ottoman Exhibition in Constantinople in 1863.—I am, &c., HYDE CLARKE.

Smyrna, Turkey, 4th Nov., 1865.

MEETINGS FOR THE ENSUING WEEK.

MON. ...British Architects, 8.
Medical, 8, Clinical Discussion. Dr. Anstie "On some Clinical Results of the Investigation of the Pulse in Disease by Marey's Sphymograph."

TUES. ...Civil Engineers, 8. Discussion upon Sir Charles Bright's paper, "The Telegraph to India, and its Extension to Australia and China."
Ethnological, 8. Mr. Thomas Wright, "On the true Assignation of Bronze Weapons, &c., supposed to indicate a Bronze Age in Western and Northern Europe."
Statistical Society, 8. Dr. W. A. Guy, "On the Question whether there is a Science of Statistics, and on its relation to Political Economy and Social Science."

WED. ...Society of Arts, 8. Mr. J. Bailey Denton, "On Water Supply, especially in Rural Parishes and Districts."

Patents.

From Commissioners of Patents Journal, November 10th.

GRANTS OF PROVISIONAL PROTECTION.

Aneroid barometers—2714—T. Cooke.
Artificial respiration, apparatus for producing—2721—W. H. Kitchen.
Blankets, endless—2716—M. L. J. Lavater and J. Kershaw.
Bottles, packing and labelling—2775—G. Clark.
Boots and shoes—2785—C. E. Goodman.
Bricks, &c., machinery for making—2728—I. Roberts.
Carriages, wheels for—2708—S. H. Rowe.
Cartridges, needle—1908—J. W. Roberton.
Coal and shale, distillation of—2793—E. Meldrum.
Colouring matters, preparing—2564—J. Holliday.
Colour slide and case—2598—J. Robertson.
Copper ore, calcining—2720—A. Bankart.
Cotton, &c., preparing and spinning—2651—G. A. Ermen.
Cotton presses—2722—C. Boyd.
Cranes, travelling—2524—D. Grieg and R. Burton.
Cutting moulds and planing wood—2711—W. B. Haigh and W. Bissell.
Doors and windows, securing—2819—A. H. Gilmore.
Driving, accelerated motion for—2779—J. H. Kitson and J. Kirby.
Driving or actuating machinery—2773—J. Garnett.
Engine, motor or pumping—2453—W. E. Newton.
Fabrics in stoves or chambers, hanging—2685—W. Schofield & J. Smith.
Fire-arms, breech-loading—2828—J. H. Selwyn.
Fire-arms, breech-loading—2752—W. M. Scott.
Fire-arms, central fire breech-loading—2709—J. and G. H. Needham.
Fires, extinguishing—2373—F. Carlier.
Flax, machinery for heckling—2781—S. Cotton.
Furnaces—2803—R. Cassels and T. Morton.
Furnaces and boilers for the consumption of smoke, construction of—2746—C. Matthews, H. B. Southwick, and J. Fereday.
Lamps—1862—A. H. Platt.
Lozenges, &c.—2730—H. A. Dufrene.
Magic lanterns, transparent slides for—2815—S. Solomons.
Marble, &c., saws for cutting—2188—E. H. Woodward.
Millstones, dressing—2817—A. V. Newton.
Nails—2789—W. Whittle.
Photographic papers, preparation of—2754—W. E. Newton.
Pigments for printing upon paper, &c.—1766—J. and R. S. Dale.
Pneumatic ways—2537—W. E. Newton.
Projectiles—2757—A. Krupp.
Propelling shafts, transmitting motion to—2807—W. E. Newton.
Pumps, rotary—2706—C. D. Abel.
Railway carriages, wheels for—2771—T. Greenwood.
Railway chairs—2724—J. D. Frazer.
Railway signals, a new self-adjusting apparatus for—2715—G. Mussell.
Retorts, mode of decarbonizing—2465—A. V. Newton.
Roller blind furniture—2696—J. Everard.
Screw wrenches—2783—J. Buckingham.
Sewing machines—2740—W. Clark.
Ships, coating for bottoms of, to prevent oxidation—2791—R. D. Dwyer.
Slide valves, pistons, and glands—2700—T. Adams and G. J. Parson.
Smoky chimneys, prevention and cure of—2602—W. Cooke.
Soda, caustic—2801—G. Robinson.
Spinning and doubling, mules for—2763—H. B. Barlow.
Steam boilers—2738—A. Chaplin.
Steam boilers, cleaning the tubes of—2761—G. Davies.
Steam boilers, heating the feed water for—2712—J. White.
Steam engines—2759—E. Hunt.
Steam hammers—2805—C. Emmet.
Stirrup-bar, double-acting safety—2704—W. Johns.
Telegraphic wires, submarine electrical, laying—2670—R. E. Kaulbach.
Telegraphic cables, submarine, laying—2705—E. E. Middleton.
Umbrellas and parasols—2348—S. Fox.
Ventilators—2799—D. B. White.
Weaving, looms for—2811—A. Jackson, J. Clough, and C. Ashley.
Window sashes and sliding shutters, suspending—2734—H. Newman.
Wool, combing—2797—G. E. Donisthorpe.
Woven fabrics, calendering and finishing—2769—E. Heywood.
Yarns and fabrics, rollers for washing—2686—W. Schofield & J. Smith.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Sugar, cleansing or bleaching—2872—G. A. Jasper.
Textile substances, ascertaining the degree of torsion in the threads of—2828—B. F. Brunet.

PATENTS SEALED.

1321. R. Winder.	1355. P. C. Lafont.
1322. W. Chubb and S. Fry.	1363. C. O. Crosby.
1326. J. Eddy.	1381. G. H. Brookes.
1340. G. Ennis.	1403. A. G. Bigorie.
1341. W. Deakin & J. B. Johnson.	1421. H. A. Bonneville.
1342. C. J. Appleby.	1517. T. Pritchard.
1343. G. Elliot and S. B. Coxon.	1553. J. Howarth.
1344. R. and H. Harrild.	1698. T. L. Jowett.
1349. H. A. Bonneville.	1718. J. K. Farnworth.

From Commissioners of Patents Journal, November 14th.

PATENTS SEALED.

1356. R. A. Brooman.	1423. G. Ashcroft.
1358. W. Montgomerie.	1426. J. Firth.
1365. W. Haigh.	1435. J. Gjers.
1367. H. Rushton.	1460. L. Moser.
1369. C. S. Billups.	1498. T. Summerson.
1379. C. Copus.	1525. A. Lancaster.
1384. H. de Mornay.	1545. C. H. Wansbrough.
1385. T. Richardson and M. D. Rucker.	1574. J. de Hemptinne.
1393. J. A. Coffey.	1707. W. E. Newton.
1395. W. and G. B. Smith.	1734. W. E. Newton.
1406. J. H. Johnson.	1884. G. Nimmo.
1407. J. M. Clements.	1942. W. E. Newton.
1410. P. A. le C. de Fontaine-Moreau.	1949. W. E. Newton.
1411. E. McNally.	2010. P. Cato.
	2332. J. Macintosh.
	2363. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3006. J. A. Fullarton.	3035. G. F. Lyster.
3011. W. Clark.	3348. W. and J. Galloway.
3021. E. Sonstadt.	3060. R. and P. Sykes.
3113. G. A. Buchholz.	3038. W. Palliser.
3022. G. Kent and E. P. Griffiths.	3049. J. Faulding.
3047. T. Bradford.	3063. A. Twaddell.
3051. J. A. Duntze.	3077. A. and H. Illingworth.
3165. A. V. Newton.	3097. C. W. Harrison.
3034. T. G. Ghislin.	

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2507. A. Henderson.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 24, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday evening, at Eight o'clock:—

November 29.—"On the Proposed Purchase of Railways by the Government." By William Hawes, Esq., F.G.S. On this evening Lord Lyttelton will preside.

December 6.—"On the Graphotype, a Process for producing from Drawings, Blocks for Surface Printing." By Henry Fitz-Cook, Esq. On this evening Henry Cole, Esq., C.B., will preside.

December 13.—"On London Milk." By J. Chalmers Morton, Esq.

December 20.—"On Parkesine, its Composition, Manufacture, and Uses. By Owen Rowland, Esq.

Cantor Lectures.

The Cantor Lectures for the present Session will consist of Three Courses, to be delivered by G. W. Hastings, Esq., LL.D., Barrister-at-law; Fleeming Jenkin, Esq., F.R.S.; and Dr. F. Crace Calvert, F.R.S.

The following are the particulars of Mr. Hastings's course:—

Lecture I.—Monday, November 27th.—"The Effects of the Discovery of the Precious Metals on the Ancient Civilisation of the Mediterranean."

Lecture II.—Monday, December 4th.—"The Effects of the Discovery of the Precious Metals on Modern Civilisation.

Lecture III.—Monday, December 11th.—"On Copyright."

Lecture IV.—Monday, December 18th.—"On Limited Liability."

The other courses will be "On Submarine Telegraphy," by Mr. Fleeming Jenkin, and "On Novel Applications of Chemistry to the Arts," by Dr. F. Crace Calvert.

The lectures will commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing one Friend to each Lecture.

Proceedings of the Society.

Second Ordinary Meeting.

Wednesday, November 22nd, 1865; William Odling, Esq., M.D., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Allen, Matthew, 61, Tabernacle-walk, E.C.
Barfoot, Edwin, 32, St. Martin's-le-Grand, E.C.
Barry, Herbert, 57, Old Broad-street, E.C.
Bowker, James, 1, Gray's-inn-square, W.C.
Brook, William Pitt, 1 and 2, Poultry, E.C..
Brooks, William Cunliffe, 81, Lombard-street, E.C.
Brown, John, 15, Rolls-buildings, Fetter-lane, E.C.
Carttar, C. Graham, 7, Skinner's-place, Sise-lane, E.C.
Dawnay, Archibald Davis, 58, Campbell-road, E., and 11, Park-street, Westminster, S.W.
Dickinson, George Francis, 17, Gracechurch-street, E.C., and Farleigh House, Surbiton, S.W.
Dornbusch, George, South Sea House, Threadneedle-street, E.C.
Evans, Charles John, 5, Princes-street, Bank, E.C.
Harris, Rev. Charles, Summer-town, Wandsworth, S.W.
Hart, John Walter, 60, St. Mary Axe, E.C.
Harwood, Edward, jun., 33, Abchurch-lane, E.C.
Hellaby, Joseph, 122, Wood-street, E.C.
Henshaw, William, 2, Sun-street, Bishopsgate, E.C.
Hibbert, Edward, 7, Jewry-street, E.C.
Langton, Rivers, 15, Laurence Pountney-lane, E.C.
Masters, Joseph Reynolds, 78, New Bond-street, W.
Morley, Henry, 4, Frederick-villas, East Brixton, S.
Nash, Alfred George, 13, Basinghall-street, E.C.
Nickisson, John Charles, 16, Watling street, E.C.
Overend, William, Q.C., 6, Queen's Gardens, Hyde Park, W.
Parker, Josiah, 44, St. Paul's Church-yard, E.C.
Price, Frederick Wakefield, 31, Upper Seymour-street, W.
Smith, S. T., Rivers Commission Office, 2, Victoria-street, S.W.
Vernon, Hon. A., Sudbury-hall, Derby

The Paper read was—

ON WATER SUPPLY, ESPECIALLY TO SMALL TOWNS AND VILLAGES IN RURAL DISTRICTS.

By J. Bailey Denton, Esq., Memb. Inst. C.E.

(Hon. Memb. Royal Agricultural Soc. of Hanover, and Principal Engineer to the Land Drainage and Improvement Company.)

When it was suggested to me to read a paper on this subject, it was at the close of September—perhaps the driest month on record—and at the end of a dry summer, following another drier still, in which the whole country had suffered from drought. The suggestion appeared to be so opportune that I did not hesitate for a moment in acting upon it. Since that time we have experienced the wettest month (October) it has fallen to my lot to record since I have been an observer of rainfall. This coincidence would have made me hesitate in bringing the subject before the Society, were it not that it aptly bears out one of the principal views I am about to advance, for to talk of the want of water, or to speak of water in any shape, immediately after experiencing the discomforts of excessive wetness, is to introduce my subject under forbidding circumstances. It may, therefore, be better to preface my observations by stating that the remedy for the present objectionable condition of the water supply of our small towns and villages in summer, which I am about to recommend, is the storage of water discharged in winter; and the appositeness of the great downfall of rain in October will be apparent when it is pointed out that if the quantity which has been allowed to run to waste during that single month, in the Midland and South-Eastern counties, had been stored for the use of next summer, the quantity collected would have alone afforded sufficient provision against a repetition of drought.

Observers of meteorology know well that it is not the fall of rain that expresses the amount of water capable of storage, unless it be in exceptional instances, where the surface is exposed rock with steep inclinations. Evaporation and surface vegetation during spring and summer take to themselves a very large share of the rainfall, leaving little or none for other appropriation; whereas in autumn and winter, when these natural agencies are comparatively dormant, the reverse takes place, and in some months nearly all that falls is discharged from the surface into the rivers or absorbed by the earth. It is therefore quite possible to have a very dry summer with a rainfall above the mean quantity, if the number of wet days are comparatively few, and the general hygrometrical condition of the atmosphere such as to promote evaporation. The last seven months (from

the 1st April to the 31st October) will serve to exemplify this effect very clearly.*

In the early months of April and June we had very little rain, and very few days on which rain fell, and vegetation being then in full vigour, and evaporation active, there was drawn from the ground very much more moisture than was deposited upon it in rain and dew. The quantity of rain, however, that fell in the intervening month of May being quite up to the average, counteracted, to some extent, the deficiency of April and June. In July and August the rain was above the average, being increased by several heavy falls during thunder storms, but such was the parched condition of the soil, and the thirsty state of vegetation, that the rain which rested on the surface was quickly absorbed and appropriated, while that which passed off replenished the ditches and ponds, and so furnished the poor of our rural districts with water, which they otherwise would not have had.

Thus partially replenished, we reached the month of September, in which there was literally no rain whatever in several of the South-Eastern counties, the only deposition of wet or moisture being dew, which was so heavy as to amount in some days to one ton weight and more per acre, an amount which admitted of being measured in the rain-gauge and recorded.

The total quantity of rain that fell on the eastern side of England, between the 1st April and the 30th September inclusive, may be illustrated by the following cases:—At York the fall of rain was 10·7 inches, of which 5·3 inches fell in 19 days in August, and the remaining 5·4 inches was spread over 164 days. At Diss, in Norfolk, the quantity that fell was 12·4 inches, of which 9·3 inches fell in 30 days in July and August, and the remaining 3·1 inches in 153 days. At the Royal Observatory, Greenwich, the fall was 13·7 inches, of which 8·4 inches fell in 30 days in the months of May and August, and the remaining 5·3 inches in 153 days. These figures, as divided, will explain how it has been that, with more than an average fall of rain, we have had a dry summer.

If we turn to the West of England—that part of the country which has generally been supplied with rain in the proportion of 3 to 2—we find the rainfall of last year very little exceeded that of the east. It will be apparent, therefore, that the views and deductions about to be advanced will apply to the west as well as to the east, though in a less degree.

The quantity of rain that fell at Carlisle in the six months from 1st April to the 30th September was 12·4 inches. of which 8·7 inches fell in 35 days, and the remaining 3·7 inches in 148 days. At Manchester the total fall was 13 inches, of which 10 inches fell in 54 days, and the remaining 3 in 129 days. At Helston, in Cornwall, the quantity which fell during the six months was 15·4 inches, of which 9·7 inches fell in 35 days, and the other 5·7 inches in 148 days.†

* Some very remarkable facts will be observed in the meteorology of the present year when compared with the last and former years. The prevalence of east wind compared with that from the west has been about double the proportion generally due to it, and the same remark will apply to the quarter from which the rain came.

† It may be interesting to compare the various summer rainfalls quoted above with the rainfalls of last year and the mean falls of former years:—

Rainfall of the Six Months from 1st of April to 30th Sept.

	1865.	1864.	Mean rainfall for several years.
	inches.	inches.	inches.
York	10·7	10·0	13·3
Diss	12·4	6·8	9.9
Royal Observatory	13·7	7·9	13·2
Carlisle	12·4	11·6	13·9
Manchester	13·0	15·8	17·7
Helston	15·4	9·3	15.35

This was the condition of the country when the rains of October set in. The total quantity of rain which fell in this month will, of course, have varied with different localities, and it will be especially observed, when the records are examined. that the rainfall in the south and east of England exceeded that of the north and west very considerably, and to a degree I believe never before recorded.

In Sussex the quantity that fell reached 11 inches, in Hertfordshire about six inches, in Suffolk about seven inches, and in Cornwall about eight inches; while in Lancashire it hardly reached five, and in Chester barely four inches.

Thus it will be seen that in one month, in which there were not more than 26 rainy days, the amount of rainfall was more than half the rainfall of the previous six months; and this large supply, it should be clearly remembered, was given us, not when vegetation was on the ground to seize it, and evaporation active to wrest it from us, but when harvest had cleared the ground of the crops, and the atmosphere was charged with moisture, leaving nearly the whole of the quantity at our disposal if we had only taken the pains to intercept it.

It must occur to all who may think on this subject that the drought, which has been repeated for two summers, may occur again with equal if not increased effect, and the reflections which will arise to the mind in contemplating the sudden and copious supply with which we were replenished last month, cannot fail to suggest a remedy, even to the uninitiated in water questions.

The little I have said on the subject of rainfall must have shown how advantageous it would be if the country possessed a thorough system of recording rainfall and evaporation under proper authority, based upon equidistant stations of observation, and not dependent on the spasmodic efforts of private individuals.

As an illustration of the truth of this remark, I believe I am right in stating that within these last two or three years the fall of rain on the Snowdonian range in North Wales has been discovered, by the efforts of Captain Mathew, of Wern, near Portmadoc, to be very considerable, forming, in fact, a source of supply which no one knew had existence. By a series of observations taken by Captain Mathew it is seen that in the past summer the rainfall of the region referred to amounted to 50 per cent. more than the greatest rainfall in any place of which records are published by the registrar-general.

If Captain Mathew's figures were compared with the rainfall of the lake district of Cumberland, there would, I presume, be but little difference between them; and when it is remembered that Liverpool, after spending immense sums of money in storage reservoirs, and wells, is without a proper quantity, that Chester possesses a very inferior supply, and that Birkenhead is dependent upon wells alone, the information supplied by Captain Mathew, though late in the annals of meteorological science, will be acknowledged to be of a most valuable character. When speaking of the deficiency of correct data, let me take this opportunity of expressing the obligation the public are under to Mr. G. J. Symons for his great industry and perseverance in organizing the best series of observations in the power of a private individual.

It is the opinion of many that various circumstances are at work to lessen the rainfall of this country, and to interfere with the influences which have hitherto prevailed, and there is doubtless much to support this view. Drainage in all its forms (agricultural or under-drainage, arterial or district drainage, and the drainage of towns), the better and deeper cultivation of the soil by steam ploughing and stirring, and the clearing of woodland and worthless hedgerows, all help to reduce rainfall; and the multitude of railways which characterise localities may have the influence Mr. Glaisher attributes to them, of attracting downfalls under certain conditions of the atmosphere. But the sea-girt position of this

country prevents a deficiency from being injuriously felt, for we have always close at hand an inexhaustible supply in the Atlantic Ocean, the North and Irish Seas, and the English Channel, from which the atmosphere can supply itself with moisture to any extent.

When admitting that the improved agricultural condition of the surface of the land owing to superior husbandry may be lessening the rainfall, though in an inappreciable degree, it is desirable to remove, if possible, the impression prevailing in the country that land drainage is helping to diminish the quantity of water discharged into our rivers. Nothing can be more erroneous than this view; the effect of all drainage is to increase the water discharged from the surface of the soil, but, unfortunately, it is discharged, not in summer when we want it, but in winter, when we have more than we want; and when in its way to its ultimate destination, the sea, it often causes floods and damage to the lower lands and towns which exist on the banks of the rivers by which the accumulated waters pass away.

If we acknowledge that the object aimed at in all works of drainage, particularly under-drainage, is to discharge the excess, which would otherwise stagnate on the land and keep it in a state of saturation until it eventually passed off by evaporation, it is clear that the quantity discharged is so much given to the rivers instead of to the atmosphere. The effect of underdraining is to make the land absorbent, and allow the rain that falls on its surface to pass down into the soil, which yields up to the drains any excess that may exist, after the retentive properties of the soil are satisfied. But it must not be supposed that this water descends from the surface of the land directly into the drains, as I am sorry to say many people think, but that it descends into the earth, and, having satisfied the demands of the soil, rises to the general level of the drains, when the excess passes away by them. The popular notion, that drains are placed in the ground to catch the descending rain cannot be too soon removed; they are placed in the land to carry off that which would rise to the surface itself, were it not that the force of gravity is brought into action by the existence of the drains, which become so many channels for the discharge of the excess which the soil cannot retain.

It is stated by many, too, that the springs which found vent at the surface of the ground before drainage are eradicated and lost by under drainage; but this is not so; on the contrary, though removed out of sight, they are increased in volume. Before draining, the water which formed these springs rose to the surface, and was exposed to the sun and wind. The result was that a large proportion was dissipated by evaporation; whereas drainage prevents the springs rising to the surface, and thus lessens evaporation, whereby the flow of water through the drains is increased by the portion rescued from the atmosphere.

Thus it will be seen that though the quantity of water evaporated from the surface is reduced by drainage, and thereby the source of rainfall proportionately weakened, the result is to augment in its aggregate quantity the discharge into the rivers. If the general effect of under-drainage is to increase in an irregular manner the water supply, there are points bearing upon our water economy which should have effect in governing the mode in which the works are carried out. It is not desirable to enter upon the mode in which drainage should be performed, but it is very desirable that it should be understood that the rate at which water is discharged from the land depends upon the nature of the drainage works. In under-drainage it depends upon the number of drains put into the soil; and in certain soils, if a greater number are adopted than are absolutely necessary for setting the water in motion, not only do they operate to the serious derangement of the river systems, but to the detriment of the productive powers of the land itself. There is not a shadow of doubt that much land of a free character is being drained by a uniform system of parallel drains, which, if differently treated, would be capable of advantageously sustaining instead of injuriously deranging the water supply—and this, too, with a better effect upon the productive capabilities of the land itself. It does not require an engineer nor an agriculturist to understand that clay lands should be drained in a different way to wet gravels and sands. A very large portion of the gravels and sands of this country are as wet as the clays, and are capable of becoming, by appropriate treatment, storage reservoirs themselves, to give out a good supply of the best of all water during summer, whereas, if they are to continue to be threaded and netted by drains, as they are now, the water hitherto stored by them will be discharged with increasing effect as drainage extends, attended by greater and more serious derangement of our river systems.

These remarks apply to under-drainage. There is another branch of drainage which, though at present affecting the water supply of rural districts in but a slight degree, will, as examples become more numerous, affect it very greatly. Our country is divided into numerous water sheds, drained by rivers, which flow down the main valleys, and are fed by tributary streams in minor valleys within the same watershed. Many of these minor valleys are water-logged, and some few of them have already become the scene of operations, under the Drainage Act of 1861, by which they have been formed into drainage districts, and are discharging or are about to discharge the water which lodged in them with instant effect upon the main valleys below.

This is the object for which districts are formed. Before drainage, the water-logged valleys performed the part of so many reservoirs, feeding the atmosphere by evaporation, and the rivers by slow percolation, through the summer; now, after drainage, the water being discharged in winter as quickly as possible, it overloads the main channel and collects in the lower valley, and not only does injury there, but interferes with the *régime* of the main rivers. Still, the drainage of such valleys is so beneficial and so profitable that it will proceed in spite of the difficulties; and it need not be repeated that the water thus discharged in winter, when it is injurious, is capable of being turned to use in summer when it is wanted.

It is not the object of this paper to dwell with any detail upon the sources upon which our perennial supplies, *i.e.*, our main rivers and deep wells, depend. All supply is gained primarily from the rainfall. The subterranean waters which find outlet by springs at the outcrop of different strata, and sustain our rivers and deep wells, are all fed from the surface by rain which descends during the winter months—from October to March inclusive—when, as already mentioned, the demands of evaporation and vegetation are at a minimum. If the winter rains are less than the average, the subterranean supply is lowered in proportion, particularly if dry and hot summers intervene to cause an excess of evaporation.

For the last three winters we have been deficient in rainfall in several of the more important quarters of England, as will be seen by the following statement furnished by Mr. Symons; and it is a well-known fact that in those quarters the deep wells were never so low as at the present time. If the rainfall of the coming winter should not be sufficiently above the average to make up for past deficiency, the sequence of comparatively dry winters and summers, which have occurred since 1861, will tell with great force. (See Table, p. 20).

The extent to which a succession of reduced rainfalls in winter act upon the springs and deep wells, is a subject to which I have recently given some attention, and I hope at some future time to publish the results. At present I can only state that measurements of wells, in the water-bearing strata, indicate with reliable accuracy that a succession of reduced rainfalls in

ENGLISH WINTER RAINFALL.

	York ... ... {above ground, 6in. above sea level, 50ft.				Wigston, Leicestershire... {above ground, 6in. above sea level, 220ft.			
	1862–3.	1863–4.	1864–5.	Mean of 20 years.	1862–3.	1863–4.	1864–5.	Mean of 10 years.
October	2·80	3·13	2·57	2·49	2·91	3·07	1·66	2·93
November ..	·83	1·85	2·45	1·99	·90	2·04	2·19	2·43
December.. ..	1·35	1·59	2·52	1·46	1·65	1·11	1·42	1·63
January	2·81	·82	1·07	1·72	2·88	·88	2·33	2·14
February	·51	1·15	1·55	1·30	·48	1·71	2·43	1·21
March	1·11	1·78	1·18	1·35	·63	2·42	1·01	1·38
	9·41	10·32	11·34	10·31	9·45	11·23	11·04	11·72

	Orleton, Tenbury, Worcestershire ... ... {above ground, 9in. above sea level, 200ft.				Goodamoor, Plymouth, Devon {above ground, 2in. above sea level, 580ft.			
	1862–3.	1863–4.	1864–5.	Mean of 20 years.	1862–3.	1863–4.	1864–5.	Mean of 20 years.
October	4·14	4·09	2·23	3·17	10·64	8·33	2·65	5·91
November ..	1·20	2·52	2·36	2·60	2·10	4·70	6·51	6·40
December.. ..	2·08	1·47	2·33	2·09	6·24	5·85	4·71	5·17
January	3·48	1·31	2·58	2·42	6·92	4·24	7·58	5·93
February	·82	1·73	2·66	1·67	2·59	3·51	5·68	4·11
March	1·11	2·51	1·13	1·79	3·56	2·93	3·91	5·11
	12·83	13·63	13·29	13·74	32·05	29·56	31·04	32·63

winter, with intervening hot summers, lower the supply beneath, and that any increase of fall in the summer does not raise the water level in any sensible degree.

This fact and the experience gained in the use of deep wells, viz., that the increasing demand for water has already permanently lowered the water level in certain water-bearing strata, must have the effect of rendering such source of supply a doubtful one, and one of which the cost will increase as the wells multiply, so as to exclude their use for small towns and villages where economy is the first consideration.* Many large towns, however, are now supplied by wells in the new red sandstone with excellent water; others by wells in the chalk and oolitic bands with water not free from objection.

It has already been shown that the effect of drainage is to reduce the flow of rivers in summer and augment them in winter. It will presently be seen, when treating of the increasing demands for water during summer, that circumstances conduce to depreciate the quality in an irresistible degree. It will suffice here to remark that all things are tending to the discontinuance, as a general rule, of the use of rivers as a means of supply of water for domestic purposes, although many large towns are dependent upon them. In exceptional cases tributary streams supply excellent water without any detracting effects; and springs taken at their source will always form envied objects by those who are seeking supplies for large towns, but they are seldom to be taken with impunity, for the simple reason that rivers are sustained by them.

Now let us consider to what extent water is used for social, agricultural, and commercial purposes; and how far those objects are likely to operate at that period of the year (summer) when the supply is least. We know from the published census the rate at which the population has increased, but we have no statistics by which we can arrive at the quantity of water used for household purposes, in contradistinction to the various ways in which it is consumed—in the factory, the steam-engine, the road, the farm, and the garden. As the population increases, the quantity supplied to each unit becomes greater too. With increasing cleanliness, water-closets are introduced into all places, and our smaller towns and villages are rivalling the larger towns and cities in the adoption of those comforts which necessitate an increased supply of water. As the weather gets warmer, and the natural supply less, the demand increases everywhere. The extended use of steam in manufactories, on railways, in the cultivation of the land, and in the duties of the farm homestead, and the use of water in watering roads and gardens, increase the demand, and, in the aggregate, swell it to a very large amount.

While the use of water is extending and the summer supply becoming less by reduced rainfall and by the operations of man on the surface of the earth, to what extent are our rivers and streams being polluted? Is it not a fact that the water we apply to our household purposes is returned into the rivers no longer as water but as sewage? This system of exchange is going on throughout the country, and, in spite of all efforts to prevent it, there does not appear to be any power to exclude from our rivers the liquid refuse of the surface. In fact, the most natural view that can be taken of the use of rivers is as the drains of the country through which they pass, for although in the aboriginal state of the country, rivers were capable of supplying water for all the purposes for which it was then required, the condition of the country is so altered by increasing population and trade, that it is not a question whether the rivers should answer the combined purposes of supplying water and removing refuse, but how they can best serve their normal purposes as drains, and drains only.

* The Rev. J. C. Clutterbuck, in his recent article on "Water Supply," in the Royal Agricultural Society's *Journal*, when speaking of the chalk stratum states the depression under London to amount to sixty feet: and it is a fact well known that some of the largest establishments in London using the water from the chalk are obliged to accommodate one another by pumping on alternate days, that their labour may not be wasted.

It is not to be supposed from this remark that there are not some rivers which may still be maintained to all time as the sources from which to obtain water for all purposes, but these are the exception and not the rule; nor must it be supposed that we are to abandon the rivers to all the filth that may be poured into them, by which their limpid character shall be lost as one of the great charms of our rural scenery, but, it must be understood to mean that, though the rivers may be brought into an inoffensive condition capable of supporting fish, they cannot, as a rule, be made sufficiently pure to supply water to human beings.

It may appear presumptuous to speak so emphatically upon a matter on which so many opinions do and will exist, but when it is mentioned that all that has yet been practically done in the way of purifying sewage has failed to do more than separate the solid from the liquid, leaving the liquid as noxious as before, the presumption will not appear so great. Science may eventually discover some means of appropriating the fertilizing gases of sewage, which, when once mixed with water, according to our present knowledge, are inseparable from it. When that time arrives, a somewhat different view of the matter may be taken, but under any circumstances the principal purpose of rivers will remain the same, and the liquid refuse, after utilization, must find its way into them, and therefore will necessitate their being maintained as drains.

The shifts to which towns are already reduced in order to obtain water and discharge their refuse at the same time may be appropriately illustrated by an instance, the particulars of which can be verified. The case is that of Tunbridge Wells, in Kent. I especially select that town because it is one of modern existence, and therefore fairly illustrates what may arise in other places where no towns exist.

Tunbridge Wells is now a large town abounding in first-class houses; indeed it is hardly possible to mention any town containing the same proportion of superior dwellings. These houses are furnished with water-closets, and all the refined appliances requiring a large supply of water. To furnish that supply has been a very difficult matter. In the first instance the springs,—which burst out on the present site of the town, and flowed by a small channel into the Medway (some five miles off), providing the population along its banks, such as it was, with excellent water,—were intercepted at their head, and appropriated for the purpose. This water, after serving the houses, for which it was abstracted, was returned in its polluted state into its old channel, and thus it flowed to the Medway a foul and corrupted sewer. So sensible were the landowners at Tunbridge Wells of the value of the springs they had appropriated that, for fear they might be affected by any operations on the part of those to whom land was sold or let, covenants were introduced into deeds of sale or lease, prohibiting the parties from dealing with the property in any way that could affect these springs. The supply so secured and protected is now found to be insufficient, and last year the authorities applied to Parliament for powers to extract springs from lands some distance away, and thereby absorb streams not in the valley of which Tunbridge Wells is the head, but in an adjoining valley, from which the water, when taken, will have to be raised over interposing high ground to a supply reservoir near Tunbridge Wells.

Thus has one large town not only converted a clear stream into a dirty sewer, but it has obtained parliamentary power to take the water it requires from another stream, and deprive the valley through which that stream flowed of any prospective value attached to a good and copious flow of water. Doubtless, an engagement has been entered into to maintain the quantity of water at present used by the people living in the valley so treated, but all future and prospective benefit is taken away, because there exists in one place a power sufficient to do it, and in the other an incapability to resist it. This case of Tunbridge Wells is cited because there is no reason to believe that what has taken place there may not occur in many other places.

Last year an effort was made by the authorities of the town of Cheltenham to extract springs, which were some of the sources of the river Thames; and, had it not been that the Thames was a metropolitan river, there is no doubt that the evil would have been consummated, and the villages and smaller places would have raised their voices in vain. This compound system of injury, first, in taking the water from poor districts to supply the rich, and next in giving them in return the discharged sewage, will of necessity be partially remedied, for it is altogether against public justice that such a system should remain unabated. But it must not be imagined that a modification which extends simply to the separation, by processes of deodorisation and filtration, of the solid matter from the liquid sewage, so as to allow the latter to pass away clear into the river, or that surface-irrigation, will restore purity.

A single instance will illustrate this, and the case of Barnard v. Arkwright will serve very well for the purpose. The plaintiff, Mr. Barnard, was a farmer, using the Harlow Brook, in Essex, as a watering place for his horses and neat stock. Into this brook the washings of the kennels of the Essex hounds were discharged. The washings were particularly objectionable, because it was found, in certain instances, that the dogs had been fed upon horses that had been glandered, and that the skins of the dogs were occasionally washed with arsenic, so that two poisons found their way in some shape or other into the brook. It was stated by the plaintiff that his horses and cattle had been killed by drinking the brook water, which the defendant denied, and an action was therefore brought. The case was tried, and the Court made an order that the objectionable refuse should not be discharged into the brook.

The master of the hounds, upon receiving the order, set to work to filter and precipitate the refuse, and, having made it clear, assumed that he had obeyed the order. The tenant in question did not concur in this view, and I was directed by the Court to see if the order had been obeyed. When I visited the spot, the filtered liquid was perfectly clear, but, suspecting that it might still be obnoxious, I obtained the assistance of Dr. Voelcker to analyse it, and he took several bottles of the clear water away with him to his laboratory at Cirencester. The water was left in the corked bottles for a few days, but when at length the Doctor opened them, in the presence of his pupils, to perform the analysis, the stench was so great that everybody had to retire from the laboratory to avoid it. The filtered refuse was as impure as ever.

If we travel northwards, into the manufacturing districts, we there see the streams which, in their aboriginal state, were limpid and pure, partake of all the colours of the rainbow, and tainted in every degree of impurity. These facts are not encouraging for the use of river-water for domestic purposes; and, taking a general view of the future—as well as the present state of things—it can hardly be expected that any amount of improvements can render the rivers generally fit for such purposes, however they may be improved as arterial drains. If it were necessary to adduce further proofs in support of this view, the application of sewage as manure to the surface of farm land would be sufficient in itself to satisfy any doubt, for although a large proportion of the manurial elements will be absorbed by the soil, there will still remain on the surface a proportion to be washed off by storms and otherwise, which will taint the rivers very objectionably, and will necessarily become greater as sewage irrigation extends.

That wells are too costly and too precarious a source, and rivers too foul and already too much reduced in volume to serve commonly as sources of water supply, is not an original view. The General Board of Health, in

1850, rejected the two sources of rivers and wells as a means of supplying the metropolis, and recommended the storage of drainage water instead. It is not necessary to endorse the views of the Board of Health in their application of this system to the metropolis, as the assumptions on which they were based have not stood the test of subsequent experience; but in a modified shape, the views of the Board appear applicable, especially to small towns and villages in rural districts. The collection of surface water in reservoirs before it reaches the rivers has been most successfully carried out in many of our larger towns in the north of England, viz., Greenock, Glasgow, Bolton, Liverpool, Manchester, Oldham, and many others. All have their gathering grounds and reservoirs, and although some of these towns have been on short supply this last summer, yet there is little doubt but that, such as the supply has been, it was better than could have been obtained from other sources.

These northern towns, however, have contented themselves with collecting the water from the surface only; in no instance, that I am aware of, has it been thought necessary to resort to under-drainage as a means of increasing and purifying the supply, as the gathering grounds have been in rocky districts of the primary formation, and the water collected has been sufficiently pure without it. But this superior condition of surface formation applies to a small proportion of England only. It is with the flatter districts, upon which small rural towns and villages are numerous, that we have at present to deal; and I will now endeavour to show how, by the storage of surface and drainage waters, they may be furnished with water in the driest summer.

There are few small towns and villages which have not in their origin had some reference to the existence of water in the shape of a spring or a stream. If it be a spring of sufficient volume it may be hardly possible to improve the supply, though as compared with the water of drainage it may be hard and inferior. If it be a stream of like sufficiency, untainted by sewage and manufactories, the same remark may apply; but if the stream has become impure by the extension of trade, by the use of water-closets, or by any other mode of defilement, the only question that will arise before rejecting it will be whether there are not times during the winter season, in which the impurity becomes so small by the dilution of rainfall, that, with the help of strainers and filters, a sufficiency of the improved supply may be collected and preserved for summer use. It is more than probable that an examination of the facts in many cases would show that this could be readily done. When the relative height of the brook and the town will not allow of a reservoir being filled directly by the former, recourse can be had to a wheel or ram to raise in winter the summer supply. The best formed hydraulic rams, made by Easton and Amos, or Freeman Rowe, with an available fall in the stream of 7 feet, will raise to the height of 30 feet one-eighth of the quantity that sets them in motion, and assuming a reservoir formed above the village to receive the water raised, a stream discharging 23 gallons per minute during the winter and spring, will be sufficient to raise in 180 days 720,000 gallons for use during the summer and autumn. A turbine, or an overshot wheel, might take the place of the ram with advantage when the quantity of water to be raised is greater than that stated. But of course the expense of either ram or wheel and attendant works would be saved in those instances where water can be brought from a height and conducted at once into the service reservoir, with an overflow to discharge the excess when the reservoir is filled. But in many instances, even where streams exist, a better supply may be obtained by the underdrainage of land in the neighbourhood; and if we resort to it, we have data which will quite satisfy the most fastidious inquirer, showing that the minimum discharge will afford a sufficient quantity of the very best water, if the area of drained land be sufficient. It is surprising, too, how few acres of land will suffice for the purpose.

When land is underdrained at sufficient depth (that is, 4 feet at least) the drains generally commence running in the month of October, and cease to run about the end of May. The proportion of the rainfall which the drains will discharge in that period will necessarily depend upon the nature of the drained land, for the larger the proportion of sand or gravel the more quickly will the rain be absorbed and discharged, and the larger will be the quantity available. In reverse degree will this be the case when the soil is clay—the denser it is the less will be discharged. The proportion discharged will vary (according to the qualities explained) from more than two-thirds to about one-fourth of the rainfall; thus, with a winter fall of 10 inches of rain and snow, when the latter is melted the maximum may be taken at 160,000 gallons per acre, and the minimum at 60,000 gallons per acre for every acre drained. The mean discharge of drained lands may be fairly taken at 100,000 gallons per acre.* The water of under drainage is free from all animal and vegetable matter, for the four feet of soil through which it passes absorbs all ammonical matter, and, in fact, forms the best chemical filterer that is known.

Analyses made of drainage waters with a view to ascertain their value for domestic purposes have exhibited most conclusive proofs of their superiority over other supplies, when to purity is added the quality of softness, which, for household uses, is a great desideratum. In this particular all evidence supports the conclusions come to by the Board of Health in 1850, but the quantity that the Commissioners assumed would be available is not supported by experience, and therefore it is that, except in a very few cases, the water of drainage may not be found applicable to large towns, though specially suitable for small ones.

If we apply the system of storing drainage water for the supply of villages in summer, we may test the question in its monetary aspect by assuming the average population of rural villages to be 400. If each inhabitant requires 10 gallons of water per diem (a quantity quite sufficient in places where the water-closet system does not wholly prevail) it will require a supply of 480,000 gallons for the summer. This quantity is taken on the assumption that for 120 days, or four months in the year, there will not be a supply from ordinary sources. To secure this net quantity, a considerable allowance must be made for waste by evaporation, and 50 per cent. on the quantity required should be added to meet this loss. A reservoir, or basin, to hold 720,000 gallons will, therefore, be required, and this quantity of water must be stored.

It requires very little calculation to show that if an acre of land, during the period of discharge, will yield 100,000 gallons, it requires less than 7½ acres to yield the required quantity for 400 persons, or 12 acres of land where the soil is of the densest character. These numbers of acres would have to be increased where the rainfall is so far below the average that a minimum quantity of ten inches cannot be depended upon during the discharging period. The reservoirs necessary to hold 720,000 gallons would be rather more than $\frac{4}{10}$ths of an acre, if the depth were taken at 7½ feet. This extent is too large for covering at a cost moderate enough for village economy, and therefore the probability is that open ponds will take the place of reservoirs, if they could be made in some convenient place above the village, and could be shaded from the sun and protected from the wind. The expense of making the pond, using the earth to embank it, and planting the embankment so as to exclude as much as possible sun and wind, and thereby to reduce evaporation and preserve the purity of the water, would be as follows:—

* See Paper on "Rainfall," *Society of Arts Journal*, January 5th, 1859.

Excavation and embankment, assuming that the earth thrown out formed a bank round the pond on which trees and shrubs may be planted, 2,500 yards at 6d.	£62	10	0
Puddling bottom and slopes, dressing bank and gravelling bottom 6 inches deep on the puddling, and constructing overflow from reservoir	102	10	0
Planting and fencing	30	0	0
Value of land appropriated to the purpose, three-quarters of an acre	45	0	0
Total cost of reservoir	240	0	0
Iron pipes from reservoir, with stop-cock, well, and brickwork	155	0	0
Four stand-pipes and taps	20	0	0
Total outlay	£415	0	0

Assuming these figures to fairly represent the cost of supplying a village of 400 inhabitants with water, and the number of houses or cottages in the village to be 100, it follows that the cost per person would be £1 0s. 9d., and the cost per house £4 3s. If the cost were charged upon the houses, and the money were borrowed to do the work, it could be repaid by instalments with interest in thirty years at 6½ per cent., and the annual charge would amount to £26, or a charge upon each house of not quite 5s. 3d. per annum.*

The capability of thus supplying villages with water is not conjectural;—every day's experience in drainage only confirms the conclusion that there are few villages in which something of the sort might not be devised. In fact the figures given represent the worst aspect of the suggestion, for nature frequently affords opportunities of collecting the water of drainage without recourse to artificial ponds, in hollows and ready-made receptacles which may be appropriated with advantage.

Of course it is assumed that there are lands above the village which require drainage and would supply the required water, and that the reservoir shall be so much above the village, that by means of iron pipes, with stand-pipes and taps, the water could be delivered down the street at convenient places, for the use of the poor.

At present legal powers do not exist enabling cottage owners in villages to charge their properties with the cost of water-supply. But this question is one of detail only, which will be met when the object is recognised as one worthy of legislation.

In closing this paper, which I am well aware is very deficient in detail, I trust I may be allowed to express the hope that I have stated enough to attract public attention generally to the important matter of the water economy of our country, and to that of the rural districts and villages in particular.

I regard drainage in its various branches in conjunction with those natural sources which are beyond the reach of defilement, as the most simple and certain means of furnishing a pure supply. This view is based on the broad facts, 1st, that of the 20,000,000 of inhabitants in England and Wales, about one-third, or perhaps 7,000,000 may be considered to be scattered over the face of the country in small towns and villages; 2nd, that whereas there are at least 16,000,000 acres of wet land in England which require draining, if they are not already drained, it would only require the water of drainage from less than 250,000 acres to supply the whole of that population with water in summer; and 3rd, that this water, which is the best of all water, is *created* by drainage, inasmuch as it would be evaporated from the surface if drainage did not discharge it.

But let this be as it may, the whole subject of our water economy is one of great national importance, and it is becoming more so every day. At present it has only been measured by partial works and interested parties. Individual towns have sought the water they require by special Acts of Parliament; the owners of streams have joined together to protect their fishing rights; towns still discharge their sewage into rivers and streams which supply other towns with water; villages are robbed of streams upon which they had depended; farmers have lost the supplies which satisfied their stock in summer; the water of under-drainage is allowed to run to waste; the waters of districts are thrown down into lower valleys, to commit injury there; and all these individual proceedings are allowed to go on because the task of reformation is too large for private legislators to take in hand, and the Government are not yet impressed with the magnitude and importance of the subject.

* Considerable objection is taken to planting round reservoirs, because leaves fall into the water and cause impurity. But, when the reservoir is annually emptied and cleansed at the end of the season of supply, this objection does not apply.

DISCUSSION.

Mr. J. F. Bateman, F.R.S., said he was sure they were all indebted to Mr. Bailey Denton for bringing this subject before the Society, and he so entirely agreed with the general principles of the plan put forward, that he was little disposed to quarrel with the details. There could be no question that a large quantity of water which might be made available was often allowed to run to waste, and no doubt the view expressing the practicability of utilising the water from under-drainage was quite correct in a great many cases, particularly in small villages; but he (Mr. Bateman) did not think it would be applicable to large towns, where, generally speaking, such a supply would not be at a sufficient elevation. While, however, he agreed with Mr. Denton in the main features of his scheme, there were some points of detail on which he might be permitted, having had some experience on this question, to comment. In the first place, the estimate of drought—120 days in the year—was in his opinion too low for the eastern portions of the country, particularly for those flat districts where this mode of supplying water would be most applicable. At Newcastle-on-Tyne, which was on the eastern side, there had been on several occasions droughts of 240 days; and from November to May, in one year, the whole amount of rainfall supplied to the reservoir was only 2½ inches. Any scheme of this kind, therefore, based upon the calculation of drought and of percolation which Mr. Denton had brought before them would fail to secure the object in view; if, however, the reservoirs were sufficiently large, and the drainage ground sufficiently extensive, those difficulties could be overcome. Mr. Denton had proposed a reservoir of a given area with a depth of seven feet. He thought this was an error in the scheme, and that the depth of the reservoir ought in no case to be less than fifteen feet. Moreover, he did not think it well that it should be shaded by planting trees round it, for the introduction of a large amount of vegetation was highly objectionable. Again, if the reservoir were small and shaded in the manner proposed, the effects upon so small a stagnant mass of water would be highly prejudicial. This did not apply with equal force to large lakes, occupying an extensive area; but small ponds, which could not be agitated by the wind, always became foul after a time. He mentioned these matters because he hoped the suggestion which Mr. Denton had brought before the meeting would be practically acted upon, and he should be sorry if any errors of detail should mar the success of his plan. He hoped to see the rivers and streams of the country used to greater advantage than they had been for the wants of the population, and that they should be unpolluted by sewage. He quite agreed with Mr. Denton in the views he had expressed of the practicability of rendering useful by storage the water now being drained from valleys, and as yet only productive of floods in winter. He only

hoped the subject would be taken up in a practical way by those for whose benefit Mr. Denton had introduced it, and that small towns would thus be better supplied with water, be more independent of weather and seasons, and the rivers more free from pollution.

Mr. Dugald Campbell said he thought, on the chemical question, Mr. Denton was correct in saying that at present a great number of rivers were in such a state that it was impossible to resort to them for water supply to the population. He hoped the time would come when they would be so purified that they might be reconverted into sources of supply for the domestic requirements of the inhabitants. As regarded the water which flowed from the land in the way Mr. Denton had described it, he thought in some instances it might do for domestic use; but from his own experience he believed in many cases it would not, as this would depend upon the materials of which the soil through which the water passed, was composed. He granted that, to a great extent, the ammonia and other material substances would be removed from the water, but in calcareous soils it would be impregnated with lime, and be inappropriate in many respects for domestic purposes. He felt much indebted to Mr. Denton for the way in which he had brought forward this subject, and he hoped that a fair trial would be given to his scheme, which he had no doubt would in many instances prove a success.

Mr. Robert Rawlinson said he had listened with some degree of pleasure to Mr. Denton's paper, and also with some degree of disappointment, especially in reference to the views expressed on various points of meteorology, with which he (Mr. Rawlinson) did not agree. The supply of water to villages was a question of great importance; the purification of our rivers was of no less importance; the application of sewage was also equally important; but he thought in treating these subjects Mr. Denton ought to have taken more notice of those who had gone before him on these questions. A great many experiments had been made with regard to the utilization of sewage, and the filtration of sewage water, by men whose names were eminent in science, and the meeting might have been informed of the results of those experiments. Then again, the Government had not quite so entirely neglected the question of the pollution of rivers as was implied in the paper. A Government Commission had been appointed to consider the injury done to rivers by sewage, by manufactures, and by dye works, and other causes; what might come of it remained to be seen. With regard to the rainfall, a knowledge of its volume alone was of very little use, for a district that gave relatively to another a much smaller volume of rainfall might still give as large an available supply for practical purposes, this depending to a great extent upon the intervals at which the rain fell. There were in the paper certain conclusions which he did not think were quite logical. They had the statement that water which had been corrupted by the refuse of dog kennels, had been by the process of filtration rendered clear, though not sweet. On the other hand they were asked to believe that water flowing over manured lands and then drained off was fit for domestic use. He did not say that deep drainage water would not in many cases be so, but he thought they should know something more of the conditions under which it was filtered. Then again he found fault with Mr. Denton for not telling them something of the actual results of land filtration upon a large scale which had been published from experiments carried out at Rugby. Then there was Croydon, where the experiment was carried out on the grandest scale, and where the water sewage of the town had been passed over and through the land for several years, and where they were under an injunction of the Chancellor that the water should not go into the river in a state more impure than the river itself was at ordinary times. He knew that experiments had resulted satisfactorily, so far as this, that the effluent water did flow off in a state not more impure than the river into which it was discharged, and so little objectionable was it that adjacent landowners had taken it into their grounds for ornamental purposes. He did not say he advocated such a supply for domestic use. As far as his own knowledge went there was no known process by which sewage water could be chemically treated so as to render it pure. All the so-called disinfectants had indeed hitherto failed in purifying the water from the salts, or, at all events, had failed to render the residuum sufficiently valuable as manure to pay for the process. But he believed it was recorded in the report of the Sanitary Commissioners (the analysis of the water having been made by Mr. Way, and the experiments conducted by Mr. Lawes and Dr. Gilbert), that the discharging of sewage water on to land did take out of it all the salts of the sewage, but that the water came off impregnated with the mineral properties of the land through which it was filtered. It seemed that it left the sewage salts in the land, and took up something from the land that it more readily assimilated with. It was a law of chemistry that to discharge one salt you must give the water something else in the place of it, and to make it as pure as rain water he was not aware of any process except evaporation. The question of a supply of pure water to villages was one of the utmost importance, for during last summer many villages throughout the country were obliged to resort to all the foul sources in the neighbourhood for water, and had to go long distances sometimes to supply themselves even from stagnant pits. One of Mr. Denton's reservoirs, though it would not give them water in all respects unobjectionable, would give them a more abundant and a better supply than that which they had been compelled to resort to. He thought the estimate given by Mr. Denton, as to the cost of the reservoirs, was much too low. A reservoir to contain that quantity of water should have more labour bestowed upon it, and he hoped if Mr. Denton was called upon to carry his plan into operation he would have the courage fairly to face the cost. He joined in the objection stated by Mr. Bateman to the shading of the reservoirs by planting trees and shrubs round them. They should also be much deeper than Mr. Denton had proposed, so as to prevent impurities from decayed vegetation and the growth of animalculæ. He contended that villages could very well afford to pay for a proper water supply, and he sincerely hoped the great landowners of this country, who had taken up the question of house accommodation on a great scale, would take up this further question. He hoped instead of relying upon subsoil drainage water, they would go further afield, because he was sure Mr. Denton would agree that where there was subsoil drainage water, there was not far off spring water. He (Mr. Rawlinson) would prefer to collect the springs, bring them down by contour lines, and place them—not in the open air, to breed tadpoles and animalculæ—but in reservoirs, with vertical sides, deeper than had been indicated, and if not covered over with brickwork, at least raftered over and covered with shingles, so as to keep out the sun and prevent vegetation. He was obliged to Mr. Denton for bringing the subject forward, and he hoped he would perfect his plan as far as possible, not confining the cost to £415 for works to contain nearly a million gallons of water. From his own experience he judged that the cost of a proper reservoir for this purpose ought not to be less than between £4,000 and £5,000.

Mr. Baldwin Latham remarked that Mr. Denton appeared to repudiate wells on the authority of the General Board of Health. Their objections, however, extended not to deep wells, but to shallow ones. Such wells certainly were not desirable in any respect, but when Mr. Denton quoted the case of the deep wells of London he thought he was in error. London seemed

unfortunately cut off by some convulsion of nature from the supply of water which was otherwise due to it, and it would seem that it was in the ground of the Kent Waterworks, which could pump seven millions of gallons per day, that the fault which intercepted the water of London existed. On one side of the ground they got no water, and on the other side it was abundant. In the works at Croydon they raised 2½ million gallons per day from wells sunk in the chalk, so that instead of ignoring wells altogether, he regarded them as the best and cheapest mode of collecting a supply of water. It was no doubt advisable in many places to carry out the plan suggested this evening, inasmuch as wells were not always available, this being dependent upon the geological formation of the locality. With regard to the pollution of rivers, Mr. Denton seemed to fear that there was no legal power to prevent sewage being turned into them, but the Croydon case showed the contrary. Previous to the injunction from the Court of Chancery they had been spending £3,000 a year for that which turned out unsuccessful; but since they had gone to nature, instead of spending, they made a clear profit of £300, which he thought was a fact worthy of notice, and he would add that the water which was discharged from the irrigated lands was of purer quality than that which was now supplied to the city of London. Analysis had shown that the water from this irrigation contained only twenty-three grains of organic and inorganic matters per gallon, while that which was supplied for the public use at Croydon contained twenty-two grains of those matters. There was another question of importance which had been solved at Croydon. It was a generally-received opinion that sandy soils only were available for sewage irrigation, but for the last eighteen months sewage had been applied on brick-earth, which was not worth £1 per acre, and he was happy to say, during the last year, that land produced sixty tons per acre of Italian rye grass, and the water which passed off was as pure as in the other case.—In reply to questions by Mr. Rawlinson and Mr. Bachhoffner, Mr. Latham stated that the amount of organic and inorganic matters in the Croydon water was thirty-nine grains per gallon in the water passing upon the land, and twenty-three grains in that which was discharged from it.

Mr. W. BOTLY thought from the statement of cost they had heard from Mr. Denton, that the reservoir system, as applied to villages, was the most economical means by which a water supply could be obtained; but he also thought that wells, when sufficiently deep and in favourable situations, should not be neglected.

Mr. BENJAMIN SHAW said that in villages at the present moment the question was not so much one of the best supply as of the getting any supply at all. Many villages were in such a condition with regard to water supply as highly to favour the advent of cholera. When they looked at the existing legal powers to meet this difficulty, they were very small indeed. By the Public Health Act of 1848, it was provided that in places where the provisions of that act were not brought into operation, it was in the power of the churchwardens of the parish to call a public meeting; and, by the sanction of a majority of three-fifths of those present, power was given to sink a well, and to charge its cost upon the rates. It was evident, from what they had heard this evening, that the power to dig one well was a very insufficient remedy for the present state of things; but if the inhabitants chose to bring themselves under the operation of the act, they had power to create for themselves a water supply. But, unfortunately, this was a matter which was left to the inhabitants themselves, who, it was to be feared, were in many cases ignorant of or insensible to the evils from which they suffered. Looking at this state of things, it occurred to him whether this Society could not enter into communication with the government with a view, in the first place, of getting an inquiry into the water supply of villages and small towns. He believed they would educe very valuable results, and, following upon that, he hoped legislative measures would be enacted, not only enabling, but compelling such places as required it, to provide for themselves a proper supply of water.

Mr. R. B. GRANTHAM, F.G.S., having expressed his personal acknowledgments to Mr. Denton for his paper, said in his position as an inspector under the Land Drainage Acts referred to in the paper he had had some experience both in land draining and arterial works; and his principle had always been to induce parties undertaking large district drainage to store the water in reservoirs in every possible way, for use in time of need. There were many cases in which he knew the land would be materially benefited and the water supply enhanced by those means being adopted. He could not agree with Mr. Rawlinson that the paper was defective from not entering more fully into the question of the fouling of rivers. He did not think Mr. Denton had that point in view in writing this paper. His principal object was to show how to supply water to villages, and for that purpose he had laid down a proposition with which he (Mr. Grantham) agreed, that was, storing the water, taking the springs from the head as much as possible, and preserving it in a reservoir. As to the water from under drainage not being pure, he thought contradiction was given to that assertion in the case of Croydon. That drainage water passed through a depth of four feet of soil; and practical testimony had been afforded this evening that it was within one grain per gallon as pure as the water that was supplied for the use of the population. He added that Mr. Denton had laid before the Enclosure Commissioners a scheme which he (Mr. Grantham) had examined, in which he proposed to carry out his principle of storing water from a very low marsh district, to the north of Frodsham, comprising 4,200 acres, which would afford a grand opportunity of testing the practicability of the plan now before them; and he sincerely hoped that that opportunity would be afforded to Mr. Denton.

Mr. HOWARD (of Bedford) said, as an inhabitant of a rural district, he felt very much the importance of the subject. He was aware of the impure quality of water that was used, because there was no adequate supply in a great many places. In his own district he had dug a pond one-third of an acre in extent, at an expense of £50, in which he stored the water which fell in the winter for use in the summer, and the inhabitants, he believed, were very much obliged to him for having done so. He thought the meeting ought to be made acquainted with the fact, that Mr. Denton had laid before the Privy Council the whole question of the water economy of this country, and he (Mr. Howard) thought the government ought to have taken it up.

Dr. BACHHOFFNER remarked that the subject of water supply was of especial importance, anticipating, as we did, the visitation of cholera next year. He believed it was the universal opinion of medical men and chemists that surface water was about the worst that could be employed for domestic purposes, and he could not imagine that filtering it through a few feet of soil could really render it wholesome. Whilst Mr. Denton averred that no process whatever could render the sewage water available for domestic purposes, he asked them to use the water that had passed over ploughed and manured lands, and finally through a few feet depth of earth.

Mr. COOPER said, with regard to the question of precipitating sewage water so as to make it fit for domestic purposes, his own experience led him to the conclusion that it was impossible in the present state of chemical science. With regard to the shallow storage which was suggested for the use of villages, he felt bound to say he could not give his approval to such a reservoir as that proposed by Mr. Denton. There was one point on

which he should like to have had more definite information—that was as to the amount of water which an acre of ground, by ordinary drainage, would yield for the supply of these reservoirs. He did not agree with Mr. Denton on this point.

Mr. Rawlinson begged permission to add, that to judge by Mr. Denton's paper, he really seemed to be unaware of the action the Government had taken. In the year 1858 the Government appointed a Royal Commission to inquire into the application of sewage, and their report had been published, with all the details. At the end of the last session of Parliament the Government appointed a Royal Commission to inquire into the pollution of rivers, in which, he maintained, that water supply was included.* He thought these facts ought not to have been ignored.

The Chairman said, in making a few remarks on the subject before them, he could not do better than, in the words of Mr. Bateman, express a hope that the parties for whose benefit Mr. Denton had brought this matte forward would avail themselves of the information whicl had been conveyed upon it. He thought some of th speakers this evening had overlooked one fact which Mı Denton brought forward with sufficient prominence viz., that in every district the local circumstances c that district must be considered; but irrespective c those local circumstances there were general prin ciples which should be regarded where no local cir cumstances existed to counteract them. They were in debted to Mr. Denton for insisting upon the importanc of storing the rain water during the time at which i fell, to make use of at times when it did not fall. H had also done good service in showing them that in thi country we need not be under the alarm of a deficiency c water; for though the total amount of water which fell i the year might be decreased by the improved processes c agriculture, yet that from our maritime situation suffi cient rain would be sure to fall if we took care t

* The following is a copy of the commission referred to:—

"Rivers Pollution.

"Victoria R.

"Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith,—To Our trusty and well-beloved Robert Rawlinson, Esquire, John Thornhill Harrison, Esquire, and John Thomas Way, Esquire, Greeting! Whereas We have deemed it expedient for divers good causes and considerations that a Commission should forthwith issue for the purpose of inquiring how far the present use of rivers or running waters in England for the purpose of carrying off the sewage of towns and populous places, and the refuse arising from industrial processes and manufactures, can be prevented without risk to the public health, or serious injury to such processes and manufactures, and how far such sewage and refuse can be utilised or got rid of otherwise than by discharge into rivers or running waters, or rendered harmless before reaching them; and also for the purpose of inquiring into the effect on the drainage of lands and inhabited places, of obstructions to the natural flow of rivers or streams caused by mills, weirs, locks, and other navigation works, and into the best means of remedying any evils thence arising:

"Now know ye, that We, reposing great confidence in your zeal and ability, have authorised and appointed, and do by these presents authorise and appoint, you the said Robert Rawlinson, John Thornhill Harrison, and John Thomas Way, to be Our Commissioners for the purposes aforesaid.

"And for the better enabling you to form a sound judgment on the premises, We do hereby authorise and empower you, or any two or more of you, to call before you, or any two or more of you, all such persons as you may judge most competent by reason of their situation, knowledge, or experience, to afford you correct information on the subject of this inquiry.

"And it is Our further Will and Pleasure that you, or any two or more of you, do Report to Us in writing, under your hands and seals, your several proceedings by virtue of this Our Commission, together with your opinion on the several matters herein submitted for your consideration.

"And We Will and Command that this Our Commission shall continue in full force and virtue, and that you, Our Commissioners, or any two or more of you, may from time to time proceed in the execution thereof, although the same be not continued from time to time by adjournment.

"And for your assistance in the due execution of this Our Commission, We have made choice of Our trusty and well-beloved Godfrey Lushington, Esquire, barrister-at law, to be Secretary to this Our Commission, whose services and assistance We require you to avail yourselves of from time to time, as occasion may require.

"Given at Our Court at Saint James's, the Eighteenth day of May, 1865, in the Twenty-eighth Year of Our Reign.

"By Her Majesty's Command.

"(Signed) G. Grey."

Instructions to the Commissioners.

"Whitehall, 30 May, 1865.

"Gentlemen,—Her Majesty having been pleased to appoint you to be the Commissioners for Inquiry into the Pollution of Rivers, I am directed by Secretary Sir George Grey to send you the following instructions for your guidance in the proposed inquiry.

"Although it may be taken as proved generally that ther is a widespread and serious pollution of rivers both from tow sewage, and the refuse of mines and manufactories, and tha town sewage may be turned to profitable account as a manure there is not sufficient evidence to show that any measur absolutely prohibiting the discharge of such refuse into rivers or absolutely compelling town authorities to carry it on th lands, might not be remedying one evil at the cost of an evi still more serious, in the shape of injury to health, and damag to manufactures. It is, therefore, suggested that your inquir should include selected river basins, illustrating different classe of employment and population; that these river basins migh be:—

"1st. The Thames Valley—both as an example of a agricultural river basin, with many navigation works, such a locks, and weirs, and mills affecting the flow of water, an many towns and some manufactories discharging their sewag and refuse into the stream from which is mainly derived th water supply of the metropolis.

"2nd. The Mersey Valley—including its feeders, particularl the Irwell, as an example of the river basin, most extensivel polluted by all forms of manufacturing refuse, particularl that arising from the cotton manufacture, and processes connected therewith.

"3rd. The Aire and Calder Basin, as an additional exampl of the same class, particularly in connection with the woollen and iron manufactories.

"4th. The Severn Basin, for the same reason, but in particular connection with the great seats of the iron trade.

"5th, The Taff Valley, in connection with mining and industry applied to metals.

"6th. A river Basin comprising a mining district in Cornwall.

"Your special points of inquiry should, it is conceived, be in the Thames Valley. 1. The condition of the river as affected by mills, weirs, and locks, and as affecting the drainage of towns and villages and adjacent lands. 2. The condition of the river, as affected both by the discharge of sewage from towns and villages, and the refuse of manufactories, paper mills, &c., and the possibility of intercepting and rendering useful or innocuous these sources of pollution.

"As to the other rivers mentioned, the main object of the inquiry should be how far the use or abuse of the rivers is, under present circumstances, essential to the carrying on the industry of these districts? How far by new arrangements the refuse arising from industrial processes in these districts can be kept out of the streams, or rendered harmless before it reaches them, or utilised or got rid of otherwise than by discharge into running waters? In the course of these investigations you will make inquiry into the effect on health and comfort of the existing system of sewage of towns and populous places in the districts examined, and into the best mode of protecting individual and public interests in the purity of running water.

"Secondary questions will, no doubt, arise contingent on these leading points, in which case you will include them, as far as it is necessary, within the scope of your inquiry.

"I am, &c.,

"(Signed) H. Waddington.

"R. Rawlinson, Esq.
"J. T. Harrison, Esq.
"J. T. Way, Esq.

Commissioners to inquire into the Pollution of Rivers."

economise it properly. Some observations had also been made with regard to the insufficiency in the amount of storage which Mr. Denton had recommended. He thought, however, that a low standard was better than no standard at all; and, as had been remarked by Mr. Shaw, in many of the villages there was scarcely any water supply. Under those circumstances this secondary supply, though not so ample as could be wished, must be regarded as of great importance. Another point of view was this, that after all, our supply of water came from the ocean in the form of rain, and the more directly we could utilize it the better. If we used the rain water before it had time to be drained into the river, we obtained it in a purer state. The observations upon sewage, made by some of the speakers, though not strictly bearing on the question, were nevertheless of such intrinsic interest that he felt he ought not to check them, proceeding as they did from gentlemen of large practical experience, some of whom were of opinion that sewage irrigation water might be thrown into the river without injury. However that might be, he trusted that would only be acted upon as a *dernier resort*. He concluded by proposing a cordial vote of thanks to Mr. Denton for his remarkably interesting and valuable paper.

Mr. BAILEY DENTON, in reply, said, as the Chairman had very kindly, and in much better language than he could employ, exposed the irrelevancy of much of the matter that had been introduced into the discussion, he would do no more than simply reiterate that the paper was not designed as an essay upon the utilisation of sewage or the purification of rivers, but as a proposal for the better supply of water to villages and towns in rural districts, which several of the speakers had shown to be in a very lamentable condition. Considering, as he did, that the time was past for the purification of rivers to an extent such as would make them palatable to human beings, he would abstain from discussing that question. In his paper he had stated emphatically, what he believed would be found to be the case, that we must not look to rivers in future as sources of supply, except at the uppermost ends and tributary streams, which had not been contaminated by the refuse of towns. Mr. Rawlinson had done him the honour of making many observations, which savoured rather of disapproval, but the context of his remarks was so concurrent with his (Mr. Denton's) own that he was willing to let the objections pass (as they were objections in detail, and not upon the principle) rather than trouble the meeting with a reply. There were some observations made by Mr. Rawlinson, with respect to what the Government were doing, which he confessed had taken him by surprise. Mr. Rawlinson had stated that the Government had issued a commission for inquiring into the subject now under discussion. He (Mr. Denton) was aware that a commission, of which Mr. Rawlinson was a member (and no one could be more fitted for the office), existed for inquiring into the pollution of rivers, and the means of purification. He did not understand that that commission was to inquire into the larger question of water supply; and, moreover, having read the terms upon which the commission was constituted, he saw that the subject of water supply was mentioned only incidentally, and was certainly not included in the duties of the commission. One of the speakers had said that he could not see the difference between filtrated sewage water and the water of under drainage, inasmuch as the latter passed through soil in which farmers' manure was placed, but it must be remembered that the proportion of manure usually placed on the surface of the ground was so small, as not to bear any comparison with the manurial elements of sewage. He himself, as a farmer, knew how little manure he was compelled to be satisfied with, and considering, too, that there were four feet of soil between the surface and the drains, he thought the comparison just referred to would not hold good, for in the case of drainage there was very little contamination and a great amount of filtration. With respect to Mr. Bateman's objections to the small depth of reservoirs he had proposed, 7½ ft., he had only to remark that he was fully aware that a greater depth would be preferable, but the real difficulty in the matter was limiting the outlay to such a cost as would induce those interested in rural districts to incur it. Every foot of additional depth, particularly in the less hilly districts, was a great additional cost, and this would materially tend to defeat the object in view. Knowing, as he (Mr. Denton) did, the feelings of landowners, he was sure the mere mention of such figures as Mr. Rawlinson had given (£5,000 for a reservoir) would at once put an end to any proposal of the kind. Remembering also, as he did, that the majority of the ponds, out of which the rural population and stock were now supplied, were not half the depth that he had suggested, and that the coolest and best water was that in ponds under the shadow of trees, he could not help thinking that the plan he had put forward, if not the best possible, was at all events the most practical. Mr. Baldwin Latham had taken objection to his rejecting deep wells as a means of supply to villages, but he repeated that if the deep wells were to be as costly as they usually were, and to involve a constant expenditure to raise the water, they were not the proper things for villages, but wells of a moderate depth were precisely the things that were required; and, to show that he was sensible of the advantage to be derived from wells, he might mention that he had, at his own cost, sunk one in his own village, Stevenage, which supplied the whole of the poor during last summer, and that he did this at a total cost of £20, including the pump.

Proceedings of Institutions.

ROYAL POLYTECHNIC INSTITUTION CLASSES. — The ceremony of distributing the prizes and certificates, to the members of the evening classes of this Institution, took place on Tuesday evening, the 21st of November, in the presence of several of the directors and a very numerous audience. The total number of certificates given was 40, of which 21 were given by the Society of Arts, 11 by the City of London College, and 8 by the Department of Science and Art. These certificates were obtained by twenty-five persons, of whom seven were ladies. The prizes were presented by Mr. T. Chambers, M.P., Common-Serjeant, and the various successful candidates having been called up and received their rewards, the Chairman addressed the audience at some length, speaking in high terms of the utility of the Institution, and specially praising evening classes as a means of education for a large and praiseworthy class of young persons. He congratulated the holders of certificates, who had shown in the most conclusive manner that they must not only have resisted many temptations to idleness, which temptations were to be found in greater abundance in London than in any other city in the kingdom, but they had resisted those temptations to amuse themselves in order to devote themselves to study in the evening in a place which, at all events, was devoted to some extent to amusement as well as instruction. Addresses were also delivered by the Rev. C. Mackenzie (the hon. manager of the evening classes), the Rev. J. B. Owen, and other gentlemen. Mr. A. Ross, in seconding a vote of thanks to the chairman, which was moved by Mr. Owen, stated that 415 students had entered themselves for the evening classes of this Institution for the present quarter. The entire sum presented amounted to £36 15s.

WORCESTERSHIRE UNION OF EDUCATIONAL INSTITUTES. —The annual meeting of the Worcestershire Union of Educational Institutes was held at Kidderminster on the 15th November. The proceedings commenced with a

morning meeting of delegates, followed later in the day by a public dinner, at which the Right Hon. Sir J. S. Pakington, Bart., M.P., presided, and subsequently by an evening meeting. At the morning meeting the chair was taken by Mr. J. S. Pakington, and among those present were Sir J. S. Pakington, M.P., Sir T. E. Winnington, M.P., Mr. Grant, M.P., &c. The President, in opening the proceedings, observed, in the course of some brief remarks, that the state of the finances of the Union was the most satisfactory that they had ever known. He then read the report, which stated, "that, despite the somewhat adverse aspect of adult education, the committee are in no way discouraged. The distinctive work which the Union was formed to promote, is steadily progressing, as seen by the large increase of candidates for the various prizes; the educational appliances also are in a much more satisfactory condition now than at the time the Union was first formed. The committee feel that the objects aimed at by the Union will be found amongst the most effectual aids to the well-being of individual Institutes. They would therefore impress upon all the friends of education the need of making increased efforts not only to enable the Union to continue its present course of usefulness, but, by enlarged contributions, further to extend it. Organisations similar to our own are on the increase. Amongst the most recent and promising of them is the Kent Association of Institutes. The Staffordshire Union also is making increased efforts in the cause of education. Your committee, however, feel assured that now the Worcestershire Union has taken its place as a thoroughly established society in the county, its friends will rally round it, and thus enable it to carry out its great aim—that of the social, moral, and intellectual improvement of the masses." Thus, while the report showed a decrease of two in the Institutes and one in the night schools respectively, the returns of the number of members in the Institutes showed a larger proportion than last year, and the female members were greatly on the increase. The number of Institutes in the Union was 26, and of members in 22 of these Institutes, 3,788; the female members being 301. The aggregate income of 21 of the 26 Institutes was £1,784 13s. 2d. The report was adopted, and Mr. J. S. Pakington was re-elected president. The vice-presidents, with the addition of the name of the Rev. T. L. Claughton, were re-elected. The other officers were also appointed. Sir J. Pakington proposed that the next annual meeting of the Union be held at Cheltenham, which was adopted.

PARIS EXHIBITION OF 1867.

The Imperial commission has lately been much occupied with the consideration of the means of securing the best possible illustrations of those industries which depend entirely, or principally, on manual labour, skill and taste. Every effort is being made to give to that department, which in 1862 was called the Process Court, great extension and importance, not only as respects French exhibitors, but those of all parts of the world. Artizans may be divided under three heads—First, those who work with and direct machinery; second, those who perform work which is also done mechanically; and, third, those who by their dexterity, intelligence, taste, or other qualities, have to the present time, resisted most effectually the concurrence of machinery. The commission says, and truly, that the first of these classes is almost the only one which has been represented in former exhibitions, and its object is to bring forward the other two, in order to inculcate useful lessons to all, and to bring to light all the various abilities of the artizan. In order to do this, the commission desires to see working in the exhibition men of all countries and callings, a working collection of the manual industries of the world, in order that working men may have a full share of the honour due to them, and that the public may benefit in an educational point of view. Such an exhibition is calculated also, says the commission, to throw light upon some of the most important questions of the present day, namely, the changes which are being made in the organization of labour in great factories, the struggle which is going on between great and small industries, and the destruction or preservation of family, or home labour. This last question is one to which the commission attaches great importance, and two classes are especially devoted to the tools, implements, processes and products of artizans working in their own homes. There is reason to hope, says the commission, that the contact of the most able and intelligent working men of all countries will aid in establishing harmony between the various nations, that all will find that they cannot claim absolute superiority over others, and that many opinions which have had deep root for centuries are nothing more than prejudices.

There is no doubt that the object in view is one of the most important and most interesting that can be included in an International Exhibition, but there is no concealing the fact that it is surrounded with immense difficulties as regards the execution. The Commission is also fully aware of this, but does not appear to shrink from the labour, outlay, and responsibilities which it must entail upon it. The means of carrying the idea into practice have been drafted out, and the following are the most salient points in the plan, which, however, must at present be regarded as merely suggestive. The Imperial Commission will take upon itself the charge of the French artizans, and will leave to the foreign Commissions the superintendence of their own countrymen, while special arrangements are made for the reception and superintendence of such other artisans as do not fall under either of these heads, who belong to countries only partially civilised, and not officially represented in the Exhibition. First, as regards French workmen, it is proposed that they shall be admitted, in some cases, on their own application, and in others, under the superintendence of a master, foreman, or delegate appointed by themselves. The Commission leaves to employers, local societies, and others, the charge of indemnifying the workmen under their care, and providing the means for their journey to and from the exhibition, and for their maintenance during their stay in Paris, but it will afford facilities for the sale of the products of these industries, and thus partially, if not entirely, provide for the expenses incurred. The goods produced within the exhibition, and, within certain limits, others from the same source, will be allowed to be sold either on the spot where they are produced, or in the bazaars which each country will be permitted to erect within the portion of the park allotted to it. In cases, however, in which the products are not saleable, the Imperial Commission is prepared to co-operate with the foreign Commissions or other representatives, and to contribute towards the support of the work provided, if it considers the object of sufficient importance to warrant the sacrifice. Another inducement held out by the Commission is that, in addition to medals awarded by the jury for superiority of workmanship, certain recompenses will be bestowed upon those workmen who exhibit the most remarkable aptitudes.

As regards the industries to be admitted to the exhibition, the only exceptions made are those of which the material or the processes employed are disagreeable, unwholesome, or dangerous, and those which require too much time for their development to allow them to be fully illustrated in a conveniently short space of time. It is understood, however, that a certain amount of originality, superiority, or special ingenuity will be demanded as the necessary qualification for admission; or, in other words, that the industry to be illustrated shall have a claim upon general attention.

In the classification of the workmen and industries, the Commission adopts the expressions *European* and *non-European*, the former including not only those actually placed in Europe, but those whose civilisation raises them to the European standard, while the other title designates

the opposite. In the list of European industries which it is desired to see represented in the exhibition, we have, first, the class which works with the aid of machinery; we find, besides the great branches of manufacture, sewing and embroidery by machinery, the manufacture of boots and shoes, envelopes, medals, confectionery, ice, chocolate, metallic pens, thimbles, nails, pipes, fish-hooks, capsules, needles, pins, pencils, bricks, tiles, &c. In the second class, that of products in the manufacture of which manual labour competes with machinery, such as the making of thread, string, rope, tissues, needle-work, netting, and knitting, printing of all kinds, the making of shawls, carpets, tapestry, embroidery, and lace, corks, wooden shoes and clogs, rustic furniture, trellis-work, the woodwork of lucifer matches, hand-made paper, book-binding, basket-work, button-making, brush-making, the casting of shot, &c.

The third class, that in which the excellence, dexterity, intelligence, and taste of the workman are peculiarly conspicuous, and which have exhibited the greatest success in resisting the concurrence of machinery, is divided into three sections:—1st. That which will be comprised within the exhibition building itself, as the manufacture of the tapestry and carpets of Aubusson and Beauvais, the making of designs and the preparation of the cards for the Jacquard loom, hand-lace making and embroidery, the making of artificial flowers and fruits; working in feathers, pearls, spun glass, &c.; fabrication of articles of clothing and small wares; working in the precious metals, and ornamental occupations, such as engraving, chasing, niello and damascene work, inlaying, incrustation; carving in wood, ivory, and metals; illumination and colouring on wood, stone, metal, paper, silk, and other materials; decorative painting on porcelain and panel; engraving on glass, gems, shell, copper, zinc, steel, stone, and wood; typographic and telegraphic composition; the polishing of lenses, and the construction of mathematical and philosophical instruments. 2nd. Works requiring the aid of fire, and which are to be grouped around sources of motive power in the park, such as the making of pottery, porcelain, glass; enamelling and filagree work, gold beating, works in the precious metals, in which the aid of fire is required; casting and working in bronze and other metals. 3rd. Agricultural and horticultural industries; photography, &c., in the park, or in places set apart for experiments and competition. The rearing of silkworms, the distillation of essences and perfumes, farming, and other employments occupying families or numbers of persons will each, as far as possible, have separate establishments for their accommodation, in order to exhibit them under their ordinary aspects.

The class of *non-European* occupations presents greater novelty and, at the same time, greater difficulty. The Commission has, however, received important tenders of assistance with respect to this class, which encourages the hope that a portion at least of the manual operations little known to the European world will be represented at the exhibition. In order to induce workmen and families from remote parts of the world to come to Paris and pursue their occupations during the time of the exhibition, and with the necessary submission to its rules, as well as to the habits of the European world, the Commission depends partly on the assistance of foreign commissions, and partly on the aid of missionaries and merchants. As regards the missionaries, it is expected that they will be able to induce some of their converts to accompany them to Paris, and also to superintend and arrange for their maintenance while here, either in the houses of the missions or in special apartments adapted to the habits and necessities of each family or party, and the Commission in all such cases is prepared to undertake all the costs. It is hoped that this arrangement will create within the limits of the exhibition a certain number of native groups, the study of whose habits, manners, and methods of working will be not only useful in an industrial point of view, but offer also valuable means of ethnological information. The same means of disposing of the productions of these strangers will be accorded as have already been mentioned with reference to European workmen.

The Commission hopes to present to the view of Europe, Laplanders making fishing-tackle; Ural Tartars employed in the preparation and ornamentation of skins and carpets; the Kabyles of Algeria making the glazed pottery of Bjerdjera, carvings in the wood of the fig-tree, ornaments in silver and coral, and carpets of Oran and other districts; natives of Morocco weaving silk, cotton, and woollen fabrics, making fez caps, saddles, and arms, and preparing shagreen; negroes of Soudan producing cotton cloth, morocco work, and pottery; the half-castes, or *Petits Blancs*, of the Isle of Bourbon making sacks for sugar and coffee; Anatolians weaving Smyrna carpets, silks, and cloth of gold; Syrians fabricating tissues and arms of Damascus, Aleppo, and Lebanon, mother-of-pearl work of Bethlehem, and gold work of Beyrout; Persians at work on Kurdistan carpets, silk embroidery, Kirman shawls, and silks and cottons of Yerd, enamelled tiles, and damascened arms; Indians weaving muslins, embroidering cashmeres, engraving ivory and wood, and twisting threads of gold into bracelets and other ornaments; Cambogians fabricating boxes and toys from sandal wood; Siamese carving rhinoceros horn; and, perhaps, Chinamen carving a nest of ivory balls; Japanese painting their incomparable lacquer wares; Mexicans turning their perfumed pottery; and red-skins composing head-dresses of feathers and bead-embroidered mocassins.

The above is a faithful sketch of subjects now under the consideration of the Imperial Commission, which calls upon all the civilised world to aid it in its labours. It is not to be supposed that the directors of the exhibition will accomplish all or half of that which it has sketched out, but its efforts will certainly not be fruitless, and there is little doubt that the Exhibition of 1867 will present an amount of variety and novelty which has never before been united on one spot.

The following are the amounts of space allotted to the various states taking part in the Exhibition:—

	Sq. Mètres.
France	64,056
Great Britain and Ireland	28,002
Prussia, Austria, and German States (each)	7,528
Belgium	7,249
Italy	3,888
United States of America	3,346
Russia	2,916
Switzerland	2,416
Sweden and Norway	2,091
Holland	1,998
Spain	1,994
Turkey	1,296
Portugal	1,134
Brazils	972
China and Japan, South America, Africa, and Oceana (each)	810
Denmark	650
Greece, Roumania, and Roman States (each)	648

Nearly the whole of one side of the building and of the park are devoted to France. Great Britain occupies that portion of the other side which is nearest the chief entrance, namely, that which faces the river; the amount of park space allotted to her is very large, and it is hoped that her model farms and cottages, agricultural machinery and produce will form a very attractive portion of the exhibition.

Commerce.

STATISTICS OF TRADE.—The total declared value of British and Irish produce and manufactures exported from the United Kingdom to foreign countries during the eight

months ending August last amounted to £70,229,031, which, compared with the shipments in the same period of 1864, shows a decrease of £4,751,794, but against 1863 an augmentation of £10,873,321. The total value of produce and manufactures sent to British possessions in the same period was £32,171,665 in the eight months of the present year; £33,735,394 in 1864; and £30,396,141 in 1863. Our largest foreign customers have been the Hanse Towns, which took £9,523,749 worth of articles; the second on the list are the United States, including the Northern and Southern Atlantic ports, and the Pacific ports, whose imports from this country amounted, from last January to August, to £9,483,084. The third is France, whose purchases represent £5,901,486; the fourth Holland; the fifth Italy, Egypt, and Brazil; the sixth Turkey and China. Russia, including her Northern and Southern ports, did not receive quite so much as £2,000,000; and then follow Cuba and Porto Rico, Portugal, Spain, Mexico, New Granada, Chili, and the Argentine Confederation, &c. Among our colonies, India has taken £12,647,687, and Australia £8,297,240; next are our possessions in British North America, the Bermudas, the British West India Islands, British Guiana, British Honduras, and the Falkland Islands, whose gross total amounts to £5,063,323. The Cape of Good Hope occupies the fourth position on the list, and Singapore and the Eastern Straits the fifth.

The Sugar Crops.—The accounts of the sugar crops in the West Indies are favourable. In Barbadoes, the continued prevalence of sultry weather during September had caused serious apprehensions in the minds of the growers as to the probable result of their operations; but the partial rains at the commencement of October, succeeded by copious showers, were sufficient to dispel all alarms, as they effected a complete change in the appearance and condition of the canes, and held out the most re-assuring promises of an abundant harvest. When canes are much advanced in the growth, slight showers are of little use, except as far as they give them a rather fresher appearance, and dispel that withered look which indicates deficiency of moisture; heavy and copious rains are needed to penetrate to the roots, and of these there has been of late an abundant supply. During the months of April, May, June, July, and August, the plantations had been subjected to an unusually trying ordeal in the condition of the weather; the unfavourable effect of the weather and of the atmosphere were most successfully encountered by those plantations which in the early season had been most plentifully manured. There was no apprehensions as to the existence of any disease in the canes, or any of those injuries, such as are caused by insects, notably the "borer;" but the ravages committed in some localities by the rats have been so serious as to induce planters to offer premiums for the production of rats' heads; but it seems that the depredations still continue. The crop of the island is estimated at about 47,000 hogsheads, but as there are still several acres of canes remaining to be cut, this estimate will probably be much exceeded. In Antigua the cane crop is highly promising, and a harvest more abundant than usual is expected. The improving quality of the cane-juice is the most remarkable feature in the accounts from the East, West, and Arabian coasts of Demerara, from Demerary River, and West Bank; but a great scarcity of labour, and also of coals, was experienced at more than one of these localities; and the crops at the Corentyne coast are rather deficient, owing to the drought in the early part of the year, the impeded drainage caused by heavy rains, and the ravages committed by the rats. In Jamaica the crops are forward, and there is an improvement in the sugar market.

Rice in Siam.—The rice of Siam is said to be some of the finest in the world, and its culture is capable of being carried on in that country to almost any extent. The following remarks on the subject are from the Commercial Report of Mr. Consul Knox, on the trade of Bang-Kok:—"The export of rice during the year 1864 amounted to 125,507 tons. The increased demand for this grain in China has already led to an extension of its cultivation, and will doubtless lead to more. The price at which it sells is ruled entirely by the demand in China, and the growers, who usually bring their own produce to market, must have realised very large profits during the last few years. The average price during the last year has been 300 per cent. higher than it was before the treaty of 1855. The land on which the seed is sown belongs to the King, and the rent charged is £2 10s. per acre. In good seasons the return from the seed is ninety fold. There is no system of irrigation, the natives trusting entirely to the rains or the overflowing of the rivers for the necessary moisture. Manure is not used, and the fields are seldom left fallow; the ground is therefore not so productive as it could be made, nor is new land brought into cultivation at the rate which might be expected. The extended cultivation has been merely on the land which was allowed to remain fallow. Thus, a person having, say ten acres, used formerly to cultivate five, and leave the rest fallow for that year; now he cultivates the whole ten yearly. The land in the vicinity of the rivers and canals is now mostly taken up, but there can be little doubt that owing to the increased fertility of the new land, it will be found profitable to cultivate it. The constant employment of the same ground, as above alluded to, will also necessitate new land being brought into cultivation. Only one crop is sown in the year."

Colonies.

Post Office Savings Banks in Victoria.—The Post Office Savings Bank system came into operation in this colony on 11th September, when banks were opened in connection with the Post Office at Melbourne, Ballarat, Beechworth, Castlemaine, Geelong, Maryborough, Sandhurst, and Williamstown. Deposits of 6d. and upwards are received, but the deposits of any one person within the space of fourteen days must not exceed £50. The interest allowed on deposits will be at the rate of 4 per cent. per annum. The regulations for the Governor of the banks, made by the Governor-in-Council, pursuant to the requirements of the Post Office Law Amendment Act, provides the machinery for the transfer to the Post Office Savings Banks of the deposits of 1d. savings banks. The business in Melbourne is conducted in the new buildings at the corner of Elizabeth-street and Little Bourne-street, now rented by the postal department.

The Co-operative System in Victoria.—The Union Fisherman's Institution of this colony lately held their first anniversary. This association, it appears, was organised 12 months ago, in the face of many difficulties and disappointments. There are now about 90 members, and their fishing extends from Port Arlington to King's Island. During the year they sold about £5,000 worth of fish. The men get the full advantage of open markets in Ballarat and Melbourne, and each receives the full benefit of his own efforts. They are paid at least 25 per cent. more than under the old system; the middlemen are put aside, and the fishermen and public are the gainers. The boats, nets, &c., are so improved as to be worth at least £3,000.

The Extraction of Gold and Silver from their Ores.—A new machine for this purpose has recently been tried at Sydney. It is called "Wheeler's Patent Amalgamator and Concentrator," and the model now in use consists of a round cast-iron pan, four feet in diameter and twenty-two inches deep, furnished with a set of grooved plates in the bottom. Inside this pan there is a revolving disc, or muller, with grooved plates attached, corresponding with those at the bottom of the pan. These two surfaces are so constructed that the ore has to pass between them, by which means it is ground into an impalpable

pulp; the pan is charged with half a ton weight of ore and sixty pounds of quicksilver, and driven by steam power. Beneath the pan there is a steam jacket through which steam constantly passes, keeping the quicksilver in a heated state throughout the process; to this action the advantage possessed by this machine over others is attributable. The quicksilver upon being heated boils up through the pulp; upon arriving at the surface, it condenses, and descends by its own superior gravity,—continuing the above operation throughout the process. The heating of the quicksilver and the precious metals with which it continually comes into contact, gives them a greater affinity for each other than they possess when cold,—thus accounting for the large quantity of gold taken up by this machine. But the application of heat in this form possesses other advantages:—it drives off the sulphur existing in the form of mundic, leaving the gold and silver in a condition to combine with the quicksilver, which in the ordinary process they will not do. It is alleged that in some instances Wheeler's Amalgamator has extracted 95 per cent. of the gold from mundic ores which have refused to yield any result under the ordinary process; and that it has, at the same time, taken out 65 per cent. of the silver—it being well known that this metal is not obtainable by the usual process of amalgamation. The ore being sufficiently ground and amalgamated is discharged into a second pan, where, by the assistance of cold water, the amalgam rapidly settles, and the tailings are discharged, when the precious metals are treated in the usual way. The inventor states that a set of these pans, consisting of two, and one amalgamator, will work one ton of ore at a charge, requiring from two to four hours, including charge and discharge. The model now at work is a twentieth of the size of the machines about to be constructed. Since the model machine has been put up in Sydney, several experiments have been made with the auriferous and argentiferous ores of the colony, with very satisfactory results.

Publications Issued.

The Magnetic Purification of River Water, and the Report of the Sewage Committee of 1864. By Thomas Spencer, F.C.S. (*Stanford.*)—This pamphlet was published in consequence of a measure introduced to the House of Commons last session by Lord Robert Montagu, to prevent the influx of town drainage into rivers, on the plea that the water of such rivers cannot thereafter be purified, which however has been withdrawn. The plan recommended by the author is the use of the magnetic oxide of iron, which is said to be of great efficacy in purifying water which has been infected by town sewage.

Notes.

The Raphael Cartoons at South Kensington.—On Saturday last a deputation of trades delegates and others appointed at a recent meeting held at Cambridge-hall, had an interview, by appointment, with Earl Granville. The delegates were Messrs. Mickeson (hatters), Richardson (boot and shoe makers), Shuff (coach painters), Cole (curriers), Preece (upholsterers), Cochrane (house-painters), with Messrs. J. Baxter Langley, R. M. Morrell, F. R. Bertolacci, E. Giles, Barnesley, Howker, Horton, and others. Mr. Morrell read a memorial setting forth that the working classes felt that in removing the Raphael cartoons to South Kensington the same regulations and facilities for viewing them should have been given as when they were at Hampton Court, and they claimed, therefore, that the gallery containing them should be opened on Sunday afternoon. It further reminded the Government that the working classes had not forgotten that the Sheepshanks collection of pictures had been accepted together with the donor's wish that they should be open to inspection on Sunday afternoon, a fact which appeared to have been forgotten by the Government, since no effort had been made to carry it out. The memorial was signed by over 100 delegates. Messrs. Morrell, Langley, Cochrane, Mickeson, Bertolacci, &c., supported the request, urging the large numbers of persons to be found on Sunday evenings at Highbury-barn, Cremorne, and similar places, statistics of which were quoted. It was shown that publicans found it worth their while to go to great expense in fitting up museums in their houses, which proved great attractions; that recently published statistics prove the large numbers who do not go to church or chapel, and for whom it was necessary to make intellectual provision; that the Government had recently opened the National Gallery as well as the Botanic Gardens in Dublin, and had thus set aside the vote of the House of Commons of some years since; and that to shut the cartoons up after so many years of their being open was a retrograde movement, seeing that the principle was the same although the place was changed, and in this battle of the rights of the working classes against prejudice every inch of ground would be maintained. Earl Granville assured the deputation of the correctness of their belief in his agreement with them on the broad question, and he concurred that the cartoons having been exhibited on Sunday at Hampton Court placed their exhibition at South Kensington on a different footing from that of the Museum itself; though, no doubt, the deputation thought that after getting the cartoon gallery open the other parts would soon follow. The National Gallery of Dublin was opened at the express desire of the people, who were, perhaps, more unanimous on the question than was the case with the people of London. The deputation were quite right in bringing the Sheepshanks bequest to his notice, and he thanked them for doing so; he should, however, like to take a few days before giving a reply on the cartoons question. He expressed the gratification afforded him by the interview. In a letter dated dated Tuesday last, his lordship says:—"It is not my intention to make any alteration in the existing rules of South Kensington."

Railway Extension and Labourers' Dwellings.—The intended terminal station of the Midland Railway Company, between St. Pancras-road and Skinner-street, and abutting on the Euston-road, to the eastward of King's-cross Railway-station, will involve the removal of the houses on the north side of Euston-road between Skinner-street and the Great Northern Railway-station (including St. Luke's Church); the houses on the west side of St. Pancras-road from Weston-street to Brewer-street, and from Brewer-street to Welford-street, the whole of Brewer-street, part of Brill-row and Brill-mews, the whole of Perry-street, Smith-street, Weston-street, Hertford-street, and the several alleys, yards, and courts within that area. The number of inhabitants, who are principally of the poorer classes, that will be thus displaced will exceed 20,000 persons. Such will be the effect of the erection of only one of the many great railway works now being constructed or in contemplation in the metropolis, on the already limited accommodation for the working classes.

The late West London Exhibition.—It is stated that two of the guarantors of the West London Exhibition—Messrs. Harris Heal, of Tottenham-court-road, and J. Hansler, of Lincoln's-inn, have examined and certified to the accuracy of the accounts, and have authorised the guarantors being called upon to the full amount of the money for which they guaranteed. The debts resulting from the exhibition amount to about £1,300, and the sum guaranteed between £1,300 and £1,400. The committee, it is stated, will lose no time in collecting the money and meeting all demands.

Glycerine for Moistening Modelling-Clay.—It is stated in *Cosmos* that some experiments have been made on the use of glycerine instead of water for moistening modelling-clay. Clay well dried, and afterwards rendered plastic by admixture with glycerine, is said to have been kept in a warm room for two months, at the end of which time its plasticity had not at all diminished. Clay rendered plastic by glycerine appears to be capable of being used over and over again, just like wax, with the advantage of always retaining the same consistence and degree of plasticity, being neither hardened by cold nor softened by heat.

Female Education.—Mrs. Arnott, wife of Dr. Neill Arnott, has signified her wish to place £1,000 at the disposal of the Council of the Queen's College, London, for the two-fold purpose of encouraging the study of natural philosophy as part of a girl's education, and perpetuating the memory and influence of her husband's writings. It is proposed to apply £400 of this sum to the foundation of a scholarship, giving a free education in the college for one year, and the right of free attendance at the classes in natural philosophy for life. Physical science will form the main subject-matter of the examination, and the scholarship will be open to all candidates under the age of eighteen. The interest of the remaining £600 will be applied in purchasing apparatus, and augumenting the stipend of the Professor of Natural Philosophy. It is said that a like liberal gift has been offered to the Ladies' College in Bedford-square.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Royal Geographical, 8½.
Medical, 8. Special General Meeting for Consideration of the Laws of the Society.
Actuaries, 7. Mr. W. M. Makeham, "On the Principles to be observed in the Construction of Mortality Tables."
Society of Arts, 8. Cantor Lectures. Mr. G. W. Hastings, LL.D., "On the Effects of the Discovery of the Precious Metals on the Ancient Civilization of the Mediterranean." (Lecture I.)
Tues. ...Zoological, 8½.
Civil Engineers, 8. Renewed Discussion upon Sir Charles Bright's paper, "The Telegraph to India, and its Extension to Australia and China."
Wed. ...Society of Arts, 8. Mr. William Hawes, "On the Proposed Purchase of Railways by the Government."

Patents.

From Commissioners of Patents Journal, November 17th.

Grants of Provisional Protection.

Artificial eyes—2813—A. Boissonneau.
Billiard tables, cushions for—2874—G. A. Smith.
Blast furnaces, separating dust from the gases evolved from—2885—C. Cochrane.
Blind rollers, suspending blinds from—2732—S. P. Matthews.
Boiler feeder, self-acting—2849—P. B. O'Neill.
Boots and shoes—2861—R. Flude.
Boots and shoes—2877—C. Mole.
Bricks, artificial stone, and marble—2867—D. Barker.
Carpet bags, frames and fastenings of—2850—J. King and A. Watson.
Carpet, doubled face—2792—A. Braquenié.
Cloths, machinery for measuring—2862—W. Hebdon.
Cylinders, combined vertical generating steam in—2776—T. B. Jordan.
Copper ore, manufacture of copper from—2838—J. B. Elkington.
Counters for indicating the distances vehicles travel—2736—M. Julien.
Croquet, articles used in in-door—2821—H. Jones.
Driving bands, &c., fasteners for—2802—T. F. Cashin and J. Felix.
Dyeing and printing, colouring matter for—2825—L. Schad.
Economising heat and curing smoky chimneys—2822—W. E. Gedge.
Electric telegraphs—2762—H. Wilde.
Envelopes—2794—R. Girdwood.
Envelope machines—1896—A. V. Newton.
Fibrous materials, preparing, &c.—2866—M. J. Roberts.
Files, renewing the teeth of—2887—J. B. O. Lassus.
Fire-arms—2800—C. Chatteway.
Gases, generating—2833—J. Webster.
Gases, inflammable—2719—I. Baggs.
Gas, purifying—2818—C. H. Wood and E. L. Barret.
Goffering and plaiting machines—2823—W. B. West.
Greenhouses—2684—T. H. P. Dennis.
Gum, artificial—2810—J. Sellars.
Invalids, facilitating the walking of—2873—F. G. Bennett.
Iron and steel—2835—H. Bessemer.
Iron vessels, sheathing—2832—E. Clark.
Knickerbockers or leggings—2788—J. Stanley.
Lace, &c., dressing—2827—W. E. Dobson.
Lathe chucks—2782—J. Buckingham.
Leaf, treating or curing the—2865—F. Campbell.
Locks—2852—W. Gardner.
Locks—2879—J. A. Rainé.
Magnesium, lamps for the combustion of—2786—H. Larkin.
Manure, artificial—2830—G. Bartlett.
Metallic pipes, &c., manufacture of—2804—A. Deslandes.
Millstones, mounting and driving—2839—R. Smith.
Mining picks—2796—W. E. Newton.
Needle—2766—L. Bennett.
Non-conducting composition—2853—J. Thys.
Paraffin oil, lamps for burning—2787—J. and J. Hinks.
Peat, drying—2824—M. Campbell, A. C. P. Coote, and J. C. A. H. Wolfram.
Penholder—2834—R. C. Lilly.
Petroleum, apparatus for burning—2829—L. Pebeyre.
Projectiles—2831—C. F. Henwood.
Pulley blocks—2884—T. Westley and W. Bibby.
Railway carriages, buffing and drawing apparatus for—2840—G. Wilson and W. K. Hydes.
Railway engines and vehicles, wheels for—2860—R. C. Mansell.
Railway trains, communication between the passengers, guard, and engine driver of—2845—H. Radcliffe.
Railways, "crossings" to be employed on—2760—J. Johnson.
Railways, permanent way of, and carriages for—2227—J. C. Green.
Railways, promoting adhesion of locomotive wheels to rails of—2798—D. P. G. Matthews.
Rifled fire-arms, preparing charges for—2856—J. Whitworth.
Roadways, construction of—2756—T. R. Crampton.
Sewage water, deodorization of—2808—H. Y. D. Scott.
Ships, propelling—2641—G. Rosselet.
Signals, transmitting and receiving—2841—A. H. Brandon.
Silk, &c., machinery for reeling—2826—E. Rushton.
Solid, waxy, or fatty substances, purification of—2768—S. Sequelin.
Spikes—2806—M. Bayliss.
Splint for surgical purposes—2871—H. Hides.
Steam engines, lubricating the cylinders of—2881—N. Beard and J. Maiden.
Telegraph wires, submarine electric—2765—W. Smith.
Textile fabrics, printing and dyeing—2859—A. Paraf.
Travelling bags, fastening for—2814—L. Pfeiffer.
Tyres, casting hoops of steel for—2886—W. D. Allen.
Windows, raising and lowering—2816—J. K. Farnworth.
Yarns, sizing—2883—J. Eastwood.

Inventions with Complete Specifications Filed.

Cabinet furniture—2901—D. Slater.
Nail machines—2921—H. C. Davis.
Needles, apparatus for threading—2924—H. A. Bonneville.
Pliant fabrics, inserting glass in—2880—J. H. Johnson.

Patents Sealed.

1396. W. Eddington.	1437. G. Bray.
1398. J. Armstrong.	1447. J. A. Heinrich.
1404. J. Shand.	1461. T. Bissell.
1409. R. Muller, A. T. Weld, and J. F. Powell.	1468. H. Moseley.
1414. A. Hett.	1477. W. Smith.
1419. T. Beanland.	1490. J. Hibell.
1420. J. Dale and A. Paraf.	1527. C. Taylor.
1425. J. Ramsbottom.	1570. H. B. Fox.
	2130. J. Stevenson.

From Commissioners of Patents Journal, November 21st.

Patents Sealed.

1427. D. Welsh.	1501. F. Richmond, H. Chandler, and J. G. Richmond
1429. D. Law and J. Bennet.	1516. J. Nuttall.
1430. R. A. Brooman.	1604. J. Griffiths.
1432. W. Madders.	1647. J. H. Johnson.
1448. R. Canham.	1719. W. E. Newton.
1449. G. Elliot and R. P. Clark.	1786. J. H. Johnson.
1450. C. B. Spaeth.	1890. C. H. Simpson.
1452. C. Frazer.	2378. H. Venables.
1453. S. Sequelin.	2406. J. Goulding.
1462. L. Diele.	2517. W. E. Newton.
1463. G. G. Bussey.	
1488. L. Martin.	

Patents on which the Stamp Duty of £50 has been Paid.

3105. J. Chalmers.	3096. E. P. Houghton.
3068. W. H. Andrew.	3104. H. J. F. Marmet.
3081. W. H. James.	3124. W. Bottomley.

Patent on which the Stamp Duty of £100 has been Paid.

2581. M. A. Muir & J. McIlwham.	2638. W. Lea.
2625. W. Marshall.	2640. H. Jordan.
2630. T. S. Cressy.	

Journal of the Society of Arts.

FRIDAY, DECEMBER 1, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday evening, at Eight o'clock:—

December 6.—"On the Graphotype, a Process for producing from Drawings, Blocks for Surface Printing." By Henry Fitz-Cook, Esq. On this evening Henry Cole, Esq., C.B., will preside.

December 13.—"On London Milk." By J. Chalmers Morton, Esq.

December 20.—"On Parkesine, its Composition, Manufacture, and Uses. By Owen Rowland, Esq.

Cantor Lectures.

Course by G. W. Hastings, Esq., LL.D., Barrister-at-law.

Lecture II.—Monday, December 4th.—"The Effects of the Discovery of the Precious Metals on Modern Civilisation.

Lecture III.—Monday, December 11th.—"On Copyright and Trade Marks."

Lecture IV.—Monday, December 18th.—"On Limited Liability."

The other courses will be "On Submarine Telegraphy," by Fleeming Jenkin, Esq., F.R.S., and "On Novel Applications of Chemistry to the Arts," by Dr. F. Crace Calvert, F.R.S.

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing one Friend to each Lecture.

Proceedings of the Society.

Cantor Lectures.

First Lecture.—Monday, November 27.

The Effects of the Discovery of the Precious Metals on the Ancient Civilisation of the Mediterranean. By G. W. Hastings, Esq., LL.D.

The following is a summary of Mr. Hastings' lecture:—The subject chosen for the two first lectures of this course forms an important chapter in the history of civilisation. That history, to which several valuable contributions have been made of late, must be conceived in a very different spirit from those which usually animate the histories of dynasties or nations. The history of civilisation must be scientific; not a mere record of facts, though always resting on ascertained data, but also investigating causes and effects, and rigorously establishing their connection; free, therefore, from all bias of race, politics, or religion. Such a history must be a scientific exposition of the action of certain forces on different communities and mankind at large; social progress being governed by laws as immutable as those which direct and sustain the rest of nature. The primary forces which induce the progress of human society are material, the moral forces being in a great degree, at any rate, resultant from the effects of the former. It will be found that the material prosperity of mankind (and hence the accumulated wealth, which is the mainspring and essential condition of civilisation) has been in proportion to the number of physical forces at their disposal. This is equally established by past history, and by comparison of various races and peoples at the present day. The rudest tribes, representing in their poverty and ignorance the primæval state of mankind, have only two forces at their disposal, which they possess in common with other animals—gravitation and muscular energy. To these has been generally soon added the force of the wind, utilised for navigation, more or less rude. These were in fact the only physical forces known to the nations of antiquity, and hence probably the comparative simplicity of their forms of civilisation. To those the middle ages added the explosive force of gunpowder, and the magnetic force of the compass, each productive of vast results; and modern discoveries have raised the five powers thus acquired by man to seven, by the addition of the expansive power of steam and of dynamical electricity. The rapidity and extent of the progress of civilisation have been in proportion to the number of forces thus acquired and utilised.* It would be possible to imagine a state of things in which such improvements as these might be confined to certain portions of the earth, and certain communities of men; the isolated, though very considerable civilisations of China and Japan corroborate such a theory. Even now, indeed, these great benefits have not touched the whole of the globe, and their full results are felt only over a comparatively small surface. But here comes in another motive power, the migration of mankind, the most energetic factor in the spread of civilisation. Migration was, of course, immensely aided by the utilisation of wind-force, water being the natural road for commerce and travel. The history of the dawn of civilisation in the Mediterranean illustrates this truth. The antiquity of the Egyptian people in a state of social order and the acquisition of wealth must probably be reckoned by tens of thousands of years; yet, though their land bordered on the Mediterranean, they exercised no appreciable influence on its other shores to a comparatively modern date, for the Egyptians had not used the wind-force—they were not navigators. It was not till the advent of the Phœnicians to the eastern shore of the Levant, at an unknown date, that civilisation began to spread. Enterprising as they were, they would probably have confined themselves to carrying for other nations, and to colonising a few accessible islands, but for one great need. At a certain point in the progress of society, and that tolerably early, a necessity arises which introduces into human affairs a new compelling power—the necessity for a currency, and therefore for some commodity adapted to that purpose. No commodities are so well adapted as gold and silver, and hence it is that all civilised communities, especially trading communities, have hungered after the precious metals with an instinct as natural as that of individuals for food. Now silver is rather rarely found, at least in any amount; and though gold has been much more universally spread over the world, it is found, owing to geological conditions, only in finite quantities, and the supply is therefore soon used up in most countries. Egypt, during its long history previous to the Phœnicians, had no doubt obtained the precious metals by caravan trade, which must have exhausted the districts round. The Phœnicians then had to find the precious metals not only for their own country, but for the nations for whom they were carriers; hence one chief cause of their wide and persevering colonisation. Their settlements (of which, as of other parts of their history, a most interesting account will be found in Mr. Kenrick's "Phœnicia)" occupied three distinct areas in

* In some countries more than one of the later discoveries has been known without being used; as for instance, in China, and *perhaps* in Ancient Egypt.

the Mediterranean. The first embraced the coasts and islands of the Levant and the Ægæan, where they had founded cities, established a civil and religious polity, and worked out fertile gold mines, when they were expelled three generations before the Trojan war by the nascent power of the Greeks. They had also anticipated the Argonauts and sought the "golden fleece" in the Euxine. The second area of their enterprise was the Central Mediterranean, where they surrounded Sicily and Sardinia with factories, occupied Malta, and founded Carthage and other commercial cities on the coast of Africa. Driven out by their own more powerful descendants (or rather silently yielding, for the Phœnician policy was never to fight for a colony), they had still a third field for mining and commerce in the south of Spain, Tartessus, the Balearic Islands, and the north-eastern shores of Africa. In fact, they encircled the Mediterranean at a very early period of history with flourishing settlements, modelled on a common type, and carrying through the ancient world the ideas of municipal government, civilised industry, and enterprise in trade and navigation. But the final results were far greater than the immediate. Over a wide surface the Phœnician was the pioneer of the Greek, who built his new states on the foundation of Phœnician settlements, adopted their laws and polity, and infused into them his own intellectual genius. The municipal idea, made illustrious by Hellenic renown and adopted into the Roman organisation, has thus become one of the leading principles of human civilisation. Nor did the progress of Christianity owe less to this diffusion of Greek thought and literature, which carried the torch of the new religion so rapidly round the basin of the Mediterranean. The immense supply of the precious metals which during their long history the Phœnicians and their successors in various countries—the Greeks, Carthaginians, and Romans—threw on the markets of the ancient world, for centuries energised commerce, promoted manufacture, and gave even to semi-civilised states the advantage of a sound currency. The diminution of the supply, towards the end of the long period of tranquillity under the Roman empire, was one cause of the embarrassment and distress that then prevailed; and its cessation (or nearly so) after the final irruption of the northern tribes produced that state of things in mediæval times which will be alluded to in the next lecture.

Third Ordinary Meeting.

Wednesday, November 29th, 1865; the Right Hon. Lord Lyttelton, Vice-President of the Society, in the chair.

The following candidates were proposed for election as members of the Society:—

Bailey, Vincent, 26, Orsett-terrace, Hyde-park, W.
Bazalgette, Joseph W., Wimbledon, S.W.
Becker, Hermann, M.D., Park Browse House, Lizard, Cornwall.
Butler, Edward R., 9, Madina-villas, Hove, Brighton.
Dowson, Alfred C., Arts Club, 17, Hanover-square, W.
Finlaison, Alexander Glen, National Debt Office, 19, Old Jewry, E.C.
Gray, William, 5, Tokenhouse-yard, E.C., and 9, The Grove, Lee, Kent, S.E.
Lambe, Frederick, 4, Villas, Erith, S.E., and 2, Cushion-court, Old Broad-street, S.E.
Latham, Baldwin, C.E., Broad-green, Croydon, S.
Mare, Charles John, 21, Great St. Helen's, E.C.
Pullman, John, jun., 17, Greek-street, Soho, W.
Talrich, Jules Victor Jacques, 42, Rue du Col de Médecine, Paris.

The following candidates were balloted for, and duly elected members of the Society:—

Angier, Frederick J., 12, George-yard, Lombard-street, E.C.
Armstrong, Robert, Union Dock, Limehouse, E.
Arnold, Frederick, 4, Mountfort-terrace, Barnsbury-park, N.
Beattie, Joseph Hamilton, 11, Dowgate-hill, E.C.
Bennett, Solomon, 111, Richmond-road, Hackney, N.E.
Brown, Andrew Betts, Vauxhall Iron Works, Wandsworth-road, S.W.
Carloss, W. I., 66, Hatton-garden, E.C.
Cooke, Lieut.-Colonel A. C., R.E., 95, Mount-street, Grosvenor-square, W.
D'Andrade, A. de Carvalho Paes, 34, Darnley-crescent, Hackney, N.E.
Denman, The Hon. George, Q.C., M.P., 1, Tanfield-court, Temple, E.C.
Denoon, Alexander, 8, Marlborough-road, St. John's-wood, N.W.
Devonshire, F. H., 1, Frederick's-place, Old Jewry, E.C.
Do Nascimento, J. C. F., 34, Darnley-crescent, Hackney, N.E.
Dufrené, Hector Auguste, 10, Rue de la Fidelité, Paris.
Dyball, Sextus, 18, Bucklersbury, E.C.
Fairlie, Fobert F., 56, Gracechurch-street, E.C.
Foster, Thomas Campbell, 2, Plowden-buildings, Temple, E.C.
Gray, Thomas, 7, Mincing-lane, E.C.
Greene, Matthew, 9, Gracechurch-street, E.C.
Hall, John, jun., 1, New London-street, E.C.
Henwood, Charles F., 4, Avenue, East India Chambers, Leadenhall-street, E.C.
Hill, Henry, 38, Bow-lane, E.C.
Holmes, William, 36, Basinghall-street, E.C.
Lepard, S., 127, Kennington Park-road, S.
Lutwyche, William, 224, Queen's-road, Dalston, N.E.
Moore, Alfred, Fitzroy-house, Bradmore-villas, Hammersmith, W.
Mountain, Charles G., Suffolk Works, Berkeley-street, Birmingham.
Nathan, Samuel L., 6, John-street, Bedford-row, W.C.
Newby, Edwin H., 31, Cheapside, E.C.
Nixon, Edwin, 2, Kennington-green, Lambeth, S.
Parkes, John T., Smethwick, near Birmingham.
Phillips, Thomas, 27, Beacon-hill, Holloway, N.
Prentis, Charles, 245, Marylebone-road, N.W.
Richardson, James N., jun., Bessbrook, Newry.
Smith, Edward, 5, Crown-office-row, Temple, E.C.
Silk, G. C., Vicarage, Kensington, W.
Stewart, Alexander Y., Apothecaries' Hall, Water-lane, E.C.
Thomas, Frederick, 72, Bishopsgate-street Within, E.C.
Treble, George, jun., 42, Gloucester-street, Hoxton, N.
Vavasour, William, Clifford Hall, Finchley, N.
Waring, Charles, 5, Victoria-street, Westminster, S.W.
Whitmarsh, William M., M.D., Hounslow, W.
Wildy, Augustus, 11, Queen's-terrace, Regent's-park, N.W.
Williams, Frederick, M.P., Gonvrae, near Truro.

The Paper read was—

ON THE PROPOSAL THAT THE RAILWAYS SHOULD BE PURCHASED BY THE GOVERNMENT.

By William Hawes, Esq., Chairman of the Council.

Although the subject I have undertaken to bring before the Society this evening differs from those which generally engage our attention, still it is of such importance, whether we view it in its commercial, social, or political aspect, that it deserves most careful consideration by this Society.

Every reflecting person must, I think, be struck with the gradual change which is taking place in public opinion, with regard to the interference of government in the ordinary affairs of life. The old constitutional jealousy of government influence and patronage is apparently

yielding to indifference to, and to a disinclination to take part in, public business.

To trace this to its origin, is not the object of this paper. It is, however, difficult to watch the progress of this change without some anxiety for the future; for there are signs that the growing disinclination of men to engage in public business, is encouraging the idea that interference by Government is specially required to ensure the best management of one class of property, which has more than any other been distinguished for the great number of able and practical administrators it has brought into notice, men to whose great ability, intelligence, and enterprise, we are much indebted for the rapid progress of our railway system.

These reflections bring me to the subject I have selected for this evening's paper—the proposition that the Government should purchase and take the management of our railways; and I propose to inquire into the alleged disadvantages of the present system of railway management, into the suggestions for removing them, and then into the advantages it is assumed will follow the introduction of the new system now brought before the public, and which receives support from some whose antecedents would have led me to expect that they would have been its foremost and most able opponents.

Before, however, entering into an examination of the details of the management of our railways, as affecting directors and shareholders, I will direct your attention to the public aspect of this new proposition. I will admit that the railway system places, as is alleged, a limited monopoly for carrying passengers and merchandise in the hands of our railway companies; but that, in my opinion, will not justify, on any ground of principle or expediency, the conversion of a limited monopoly into a huge monopoly managed by the Government. That Parliament should interfere to secure an organisation necessary for the safety of the public, few will object to, but this is quite distinct from the purchase and management of our railways by the Government.

Mr. Galt, in his work,* which appears to embody all that can be said on the subject, endeavours to justify the purchase of the railways by the Government by stating "that the highways of a country are as necessary to a people as the air they breathe," and that the railways have become these highways; and Mr. Chadwick says† that "Public communications are not a legitimate object for mercantile profit," and "that all charges on transport should be reduced to the bare cost of service, to the exclusion of profit, or strictly to the exclusion of tolls."

But the Government did not manage our highways before the existence of railways—it did not interfere with the tolls levied—they were managed by Boards of Trustees; and I would ask, had the Government held the property vested in these Trustees as it is proposed it should hold that vested in railways, and had the tolls formed an important element in the revenue accounts, as it is now proposed the railway receipts shall do (p. 306 of Mr. Galt's work), how long it would have taken to introduce railways in opposition to the influence Government would have exerted to retain such an important source of revenue, and the patronage belonging to its collection; and should we now enjoy our existing facilities for travelling, and the present perfect system of railway management? for with all its shortcomings I call it perfect, as compared with that to be found in any Government manufacturing or administrative department.

The only instance I am aware of which can be adduced to prove that under Government direction success has been achieved in the conduct of a large commercial establishment is the post-office, and upon this assumed success Mr. Galt bases most of his arguments, and arrives at the conclusion that because it is, as he asserts, well managed, and carries letters at one uniform rate, and discharges its duty generally speaking to the satisfaction of the public, the Government must also succeed as well in the administration of railways, and will carry passengers, as it does letters, at a uniform rate, much below that now charged by any railway company. But does the Government deserve this unmixed praise for the administration of the post office? First, as a political department presided over by a cabinet minister. It is too notorious to waste a word upon it, that appointments in the post office are regularly sought for and given to the supporters of the political party for the time being in power. Is this mode of appointment to be desired for railway officials? But Mr. Chadwick will reply that the bad distribution of patronage is not a necessary condition of Government. Certainly it is not, but experience tells us that so long as patronage is in the hands of the Executive Government, so long will it, to a great extent, be distributed among its supporters.

Then as to the general management of the post office and its success—Could this have been obtained but for the active co-operation of the railway directors, who have most efficiently seconded the post office authorities in their desire to facilitate and expedite the delivery of the mails by converting a railway carriage into a letter-sorting office; and where our railway system comes in conflict with Government management, is the one or the other to be most relied upon? In the last report of the London and North-Western Railway I find that complaints having been made to the post office respecting the irregularity of the Irish mail service, it was proved that that part of the service managed by the London and North-Western Company during the time to which the complaints referred (22nd to the 31st October, 1864) had been performed with most marvellous punctuality, that the down day mail train had arrived at Holyhead, on the average, within four-tenths of a minute of the appointed time, and the down night train had arrived within one-tenth of a minute of its appointed time. Indeed there can be no doubt but that the irregularities in the time at which the mail bags arrived at the Euston station from the General Post-office—a government establishment but a few yards off—were many times greater than those which occurred in the time of the arrival of the trains running 250 miles, and that this irregularity had to be made up by the efficiency and energy of the railway company. There is one very important difference between the management of the Post-office and railway companies, not mentioned by Mr. Galt; if a letter be lost, or unduly delayed, no matter what the letter contained or the nature of the business it referred to, the public have no remedy against the Post-office—not so with railways, which are responsible for injuries to person and property arising from neglect or carelessness. Would the Government admit this principle if it had the care of our railways?

Then let us refer to the mail packet service, a branch of the Post-office, for if Mr. Galt's principle be a good one, it must apply equally to the carriage of mails and passengers by sea as by land. Did the Government, when they conducted the mail packet service, put on fast steamers? Was it not the greatly superior speed of the ships belonging to the Mail Packet Companies, and the economy of the public funds, which it was proved would follow their employment, which obliged the Government to give up the monopoly of the packet service? And have not these companies created steam fleets of unexampled power, swiftness, and efficiency, superior to any fleets built by the Admiralty? Does anyone ever hear of a Government steamer making a quicker run than a Cunard, or a West India mail packet, or a Peninsular and Oriental ship? Really, to argue that Government would have enterprise to make railways better than our public companies—to make them,

* "Railway Reform, its Importance and Practicability." By William Galt. (*Longmans.*)

† "Address on Railway Reform," by Edwin Chadwick, C.B. (*National Association for the Promotion of Social Science.*")

in many cases, before they appear to the general public to be absolutely required, as is now done by those acquainted with each district, and who can anticipate a coming trade—or that without competition it would introduce improvements, or that it would manage them cheaper or better than at present, is to ignore all experience. In fact, to place our railways in the hands of Government would be to stop improvement for years to come, and to extinguish one great source of public enterprise—indeed, it is hardly possible to see how improvements in such a vast machine could be made, if instead of a limited and divided monopoly, with sufficient competition for healthy action, it became one huge monopoly in the hands of the Government.

But I must not yet pass over the post-office, for it aptly illustrates how injurious to the country it has been, and always must be, to leave the initiation of great public works of improvement, necessary for the development of the industrial resources of the country, to the Government.

Every step in the progress of the post-office for the last hundred years has been opposed by the Government of the day. I will only just refer to the time when individuals took local contracts to carry letters, because the Government refused to put on mails, and to the difficulties Mr. Palmer met with in reforming the mail-coach system at the end of the last century, but I will call your attention specially to the progress of postal reform in our own time. Who opposed and who supported the plan of Sir Rowland Hill?—The Government opposed it, and it was many years before the public could force this great improvement on the authorities of the post-office; and when it was adopted by Parliament, the *vis inertiæ* of official apathy for a long time excluded from employment in the Post-office the able man to whom the world is indebted for the introduction of this noble work, and who alone was able to carry it out with entire success. Again, had our turnpike roads been in the possession of the Government, and had a considerable amount of revenue been derived from them, would the Government have encouraged and supported George Stephenson in his early railway enterprises? Or, having attained the speed of the first railways—say twelve miles per hour—would it have sanctioned the experiments and the expenditure incurred by our railway companies to increase the speed, so that we can now travel with safety and certainty at the rate of forty miles per hour? The advocates of the new system deprecate those conflicts of intellect and of interest before the Committee of the Houses of Parliament which have yielded such great results. I believe, with all their abuses and faults, progress would not have been so rapid as it has been without them, and that it is this conflict of intellect and interest before the Committee of the House of Commons, and which applies to many other works than railways, which keeps this country a-head of all the world.

But we are told by Mr. Galt that Government could afford, and that railway companies cannot, to run trains for a time at a loss, looking to the eventual recovery of that loss by the increase of traffic which must follow the great stimulus which low fares will give to the productive power of the country. Let us then inquire if experience justifies this assertion.

Has the Government, through the Post-office, taken up that great supplement to our postal service, the electric telegraph? Are not all our telegraphic communications in the hands of public companies? Has the Government given any important aid in laying the Atlantic Cable, which, if successfully accomplished, will, from the scientific knowledge displayed, the physical difficulties overcome, and the magnitude of the results to be gained, be one of the greatest works of man.

Did the experiments on which success may be predicted originate with the Government, or, anticipating the great political and commercial results which are sure to follow the accomplishment of this national work, did it take the risk of the expenditure of laying the cable, as the advocates of the new system of railway management assure us it will now do with regard to new railways, if our railways were transferred to its charge?

How is it, then, if the Government be so capable of efficient and economical administration, and so ready to promote improvements, that it has left to associations it is now the fashion to decry, the introduction of this the greatest wonder of the age, holding, as it does, the postal monopoly; and how is it, if Mr. Galt's view be correct, that it leaves to the public the organisation all over the world of a system of communication which already supersedes a vast amount of ordinary postal correspondence, and which threatens, by its gradually-reducing tariff and constantly improving management, to monopolise all that for which time is the all-important element. There cannot, I think, be a better illustration of the non-progressive character of Government action than a comparison of its ordinary procedure with the spirited and enterprising conduct of our electric telegraph companies. But I will go further, and say that all Mr. Galt's reasoning upon the success of the administration of the post-office rests upon the assumption that even this establishment could not be better managed by a well-organised corporation than it is by the Government.

Looking at the gross receipts, nearly £4,000,000 per annum, and the service rendered for it, I venture to think it might be as well or better done, and at a vastly diminished cost, one-third of the gross receipt being net profit, if the whole of the postal service instead of part, were under the direction of a properly-constituted board, free from Government influence and patronage, and that we should not then have the complaints we now read day by day in the newspapers of stolen, missing, and lost letters, and of disaffection among the persons employed, followed by prosecutions at each Old Bailey Sessions; and I venture also to suggest that had Sir Rowland Hill, with his great administrative capacity, been placed at the head of an incorporated company to direct our postal arrangements, they would have been brought to their present state, and even to a still higher degree of perfection long ere now, and that it would not have required 25 years to bring up the net receipt at the reduced rates to that which was received at the high rate in 1837 (p. 203); in these views I am happy to find Mr. Chadwick concurs, for he says that "if postal reform had been confided to Sir Rowland Hill there would have been no loss of revenue from the first" * * * "that no management is so dangerous as that of the ignorant, indifferent, safe man," (his description of Post-office officials), and that by the Government management "improvement was delayed, and the public paid for it."

If, then, examination into the working of the only public establishment, on which Mr. Galt and Mr. Chadwick rely to prove the advantages the public would gain by the railways of the country being placed under Government control, proves that it cannot be relied upon, other establishments may be safely appealed to, to prove the impolicy and loss which would inevitably follow such a change. Is there any evidence of a great public establishment being managed economically by the Government? Does it not make mistakes in the choice of sites, fortification works, for instance; does it proceed rapidly with its works, improvements in ship-building, for instance, and would not public enterprise, if it had been called into action, have determined the vexed question of guns, and iron-plated and cupola ships, long ere now, not by proceeding in the tentative, official way invariably adopted by Government, but by bold and energetic action, incurring expenditure, making blunders at times if you will call them so, but gaining experience, as it only can be gained, by trials and disappointments, the surest road to ultimate success. Do we not read in speeches in Parliament—in newspapers of every political opinion—of the extravagant management of our great military and naval services, the annual effective expenditure upon both of which is little more than our

railway expenditure? Are our dockyards in their internal arrangements and in the mode of keeping their accounts to be compared with those of our great railway companies? Do they present annual balance sheets? Is there the same care for those employed—the same check over expenditure, and the same satisfactory results as are accomplished at Wolverton, at Swindon, and at other large railway establishments? Is it not notorious that Government rarely gets its money's worth for its expenditure? Have we forgotten the Caledonian Canal which was a work recommended by the advanced engineers of the day, and executed by the Government? Would the cost and quality of the fuel supplied to our Government steam service bear comparison with that supplied to the Cunard, the Peninsular and Oriental, and the West India Mail Packet companies? Or, looking at the accounts recently published of the internal management of the Patent Office and of the War Department, both of which have been remodelled in the last few years, can anyone propose to place all our railway officials under a similar administration, and that they should be treated in the same way. Indeed to advocate the management of a great commercial establishment by a Government department as a matter of economy and efficiency, and as the best means of obtaining the maximum of work for the minimum of cost, appears to me to show entire ignorance of past and present experience. Such establishments may be necessary on political grounds, but not on those of efficiency and economy.

I will now proceed to the main question. Would passengers and merchandise be carried cheaper and in greater safety than they now are, if our railways were under the control of the Government? I say than they now are, for the tendency of the management of all our great lines is to reduce fares and to increase the accommodation of the public as traffic is developed, as railway machinery is improved, and as the public require increased facilities for locomotion.

It is necessary for me first to state that, while opposing Mr. Galt's views, and supporting the principle of the existing railway management as opposed to that by the Government, I am not insensible to the great improvements which are sure to be gradually introduced, or to the reduction of existing charges which is sure to follow such improvements, but, admitting this, I contend that improvements and reduced fares will be introduced more rapidly and more advantageously by the existing than under the proposed management. I believe that the increased knowledge of the capabilities of railways, and the greater command over locomotive power, which experience is giving to our traffic managers, will tend to lower fares, to increase the speed, and to promote punctuality, but this can only be done gradually, and will be better accomplished by the rivalry and competition now existing between railway managers than would be possible if all the lines were directed by one Central Board. For instance, should we have, during the summer months, if the Brighton, South-Eastern, and South-Western were under one control, the beneficial competition there now is between those lines to induce passengers to select the watering-places connected with each line, or would a government board have undertaken metropolitan lines to cost £300,000 or £400,000 per mile? Would it have accepted the risk of proving that under special conditions the most expensive line with the lowest fares would pay best? Indeed, metropolitan omnibus railway traffic is yet in its infancy, and still requires the stimulus of rivalry and competition to give the public the full measure of convenience it is capable of, and when this is accomplished, the revenue, though now apparently large per mile, will greatly increase, to the advantage of those enterprising shareholders whose energy and spirit are so beneficially exercised for the public. Mr. Galt, however, desires that this energetic and spirited management which has done so much should sink into the dull routine of a government office, which always considers what is, is the best, and shrinks from the trouble and exertion inseparable from the introduction of every improvement. So far as I can see, railway directors are adopting in the management of the property entrusted to their care the sound economical principle that the highest rate of profit will be obtained from carrying the greatest number at the cheapest rate; the limitation to the number carried, and the minimum fare, being fixed by the physical conditions which belong to each system of railways.

Let us now examine the grounds upon which Mr. Galt asserts that the reduction of railway charges to one-third of their present rate will increase the gross revenue 50 per cent., and that the net revenue will equal what it would be were the present high rates, as he calls them, continued (page 300), and also "that it is impossible the low-fare system can, as a rule, ever be adopted by railway companies." (Pref. p. 24.)

In the fifteenth article of his *résumé*, Mr. Galt advocates a greater reduction than 66 per cent., for he advises (page 307) that by ordinary trains the fares, 1st class should be $\frac{3}{4}$d.; 2nd class, $\frac{1}{2}$d.; and 3rd class, $\frac{1}{4}$d. per mile. He does not state whether at these rates the net revenue would equal that now realised; but as in paragraph 21, page 309, he says the reduction of two-thirds of our railway fares would be more beneficial than the repeal of our Customs and Excise duties, I must presume he contemplates such a loss by this reduction of fares as to preclude any reduction of Customs and Excise duties for years to come; such, indeed, as will swallow up not only the existing surplus, but the constantly accruing increase which, under our decreasing tariff, it is shown, may be relied upon. It is not clear what reduction of fares Mr. Chadwick would recommend when he says that the "cost of transport should be reduced to the bare cost of the service, or strictly, where possible, to the exclusion of tolls."

Let us, then, before we go further into figures, look a little into this part of the subject. Travellers, whether for business or pleasure, are now carried at rates which yield only a very moderate return upon the capital employed; Mr. Galt proposes they should be carried for less than cost price, and that merchants should receive a bounty on their trade by the transit charges for their merchandise being fixed by a Government establishment at less than the actual cost.

Is this Mr. Galt's political economy? He prefers to carry passengers under cost price, at the expense of those who do not travel, to the reduction of the duties on tea and sugar, which would benefit every one. He prefers to continue taxes on necessaries of life to making each traveller and each ton of merchandise pay for its transit the cost price and a fairly remunerative profit. Mr. Galt admits there would be a loss for many years, and that the loss must be provided by the state; and he prefers the taxation of all to making the few pay a fair price for their travelling, whether for pleasure or business. "But," Mr. Galt will say, "I have shown that the reduction I propose can be made profitably; that the actual charge at the present time is much beyond the cost price, which alone the Government should levy." He says it is shown (p. 305) that the existing variation in the rates of fares from $\frac{3}{4}$d. to 3d. per mile for first-class, and from $\frac{1}{2}$d. to 1d. for third-class, makes comparatively little difference in profit to the shareholders; and further, that where by reason of local opposition, or from other causes, fares have been reduced 70 per cent., dividends have not been in any case reduced more than one per cent. per annum on the capital.

If Mr. Galt believes that these figures give an accurate representation of the facts of the case, why does he afterwards suggest that it is better to charge these low rates than to reduce customs and excise duties? If they would pay, and if, as he says, they have been tried and found to pay, he ought to take the balance sheets of the great companies, and point out under which

head the extravagance and bad management which cause such unfortunate results arise. But he does nothing of the kind; and I will show why he cannot do so. First, as to his facts. Mr. Galt takes the fares of three lines and compares the figures only—he does not notice the peculiar character of each line—and he wishes his readers to infer (p. 80) that because a line, running through the densest population in the world, and chiefly occupied by what is called omnibus traffic, yields a profit while charging only at the rate of 5s. per 100 miles, that, therefore, every other line can do the same; and that the London and North-Western and the Great Western, with their hundreds of miles of line, carrying passengers and their luggage long distances, through districts with a scanty population and as little trade, can carry their regular passenger traffic as profitably at the rate of 5s. per 100 miles as the Metropolitan does on its four miles.

Mr. Galt must know that no fair comparison can be made between the rates charged by a metropolitan omnibus line and a long line traversing the country.

If 5s. per 100 miles pays the North and South Western Company (page 80) and other metropolitan lines, many of the directors of which are also directors of long lines, does Mr. Galt think they have not inquired how it is that 16s. and 29s. per 100 miles do not realise on the other lines, of which they are directors, enormous dividends?

Having these facts before them, and anxious as the directors of our great lines are to improve their dividends, must not Mr. Galt know as well as they do that the cases are totally dissimilar, and that the paying rate per mile or per passenger on one line does not of itself at all indicate what may be the paying rate on another. For instance, the general bulk of passengers on the London and North-Western, unlike those on metropolitan lines, have luggage, which not only nearly doubles the weight to be carried per head, but requires expenditure to manage and to protect it. Then the one has half a dozen stations within a few miles, whereas the other runs many miles without a station, and the stations when they occur are of an entirely different character and cost. In the one case a train may earn 20s., 25s., or even 30s. per train mile; in the other very often, and for long distances, not 2s. 6d. per train mile.

To compare such dissimilar things, and to reason upon averages produced from such entirely dissimilar data, is manifestly unfair, and can only mislead the public.

No traffic manager doubts that on the metropolitan omnibus lines fares may be very low and very profitable, but to apply the same rates to the ordinary traffic on long lines would be absurd and ruinous. The one carries millions short distances with the smallest amount of superintendence and station accommodation, the other hundreds only, long distances, requiring expensive management. The one passes through a dense population always in motion to and fro in the direction of the line, and the other through a thinly populated country, where there are but few travellers, the cost of the train per mile being nearly the same in both cases.

But, singularly enough, Mr. Galt subsequently shows that these high charging lines now do, when the necessary conditions are fulfilled, that which he previously stated it was impossible they ever would do.

At page 85 we find that the South-Eastern, the London and Brighton, London and North-Western, and Great Western, carry excursionists long distances, first-class, at 3s. 8d., 4s., 5s., and 6s. 3d.; and, second-class, at 1s. 8d., 2s., 3s. and 4s. 2d. per 100 miles, the rates varying according to the distance and special circumstances of each line.

These facts prove that so soon as you convert these great lines into omnibus lines, carrying people with little or no luggage in great numbers from point to point, they reduce, without any Goverment pressure, their fares as much as even Mr. Galt desires—in fact, that at those periods of the year when there are travellers in sufficient numbers to fill the trains and willing to travel under certain conditions, the railway companies do all they can to stimulate the traffic by an adequate reduction of price—a reduction, in fact, of more than two-thirds of the ordinary fares.

But will Mr. Galt say that even if you carried people for nothing, you could fill such trains except in fine weather, and during the long days in summer? And if ordinary traffic is to be reduced to the lowest price of omnibus traffic, how are the outlying districts where no such traffic exists to be supplied; and would not his suggestions, if carried out, lead to the absolute neglect of non-paying districts, but which are now well attended to by the charges for ordinary traffic as distinguished from omnibus traffic?

It is, however, upon the erroneous application of such data that all his reasoning depends. He does not take a London and North-Western annual statement and show where expenditure is double that which is necessary, or where it can be reduced, or by what means the number of passengers can be rapidly increased from 10 millions to 30 or 40 millions, or the weight of goods from 6 to 18 or 20 millions of tons, or how he is to secure, summer and winter, full trains, upon which he relies for his proposed economy of power and expenditure, so that, with treble the number of passengers at one-third the present rate, he is to have the same receipts and to secure the existing rate of profit.

Mr. Galt no doubt believes, and wishes his readers also to believe, that railway directors keep the public in ignorance of the internal working of the railway system (p. 153); but had he read with any care the annual reports of the great railway companies, he could not have made the statements we find in his book; for he must have seen that on every line an increase of traffic is invariably followed by an increased expenditure. He says the average number of passengers carried by each train is 50, and that 500 could be carried by the same power; but forgets that this additional 450 passengers, weighing in themselves about 30 tons, would require ten or fifteen extra carriages, the power required to move which, without passengers, would soon prove the incorrectness of such an assertion. No attempt is made to show what would be the increase of expenditure required to carry three times the ordinary number of passengers, for if that would be great—as every one must see that it would for extra steam power, extra carriages, and more station accommodation and attendance—then the additional revenue to cover the cost of this increased outlay must be supplied from a further and large increase in the number of passengers beyond the trebled number necessary to realise the same income as was received before the reduction of two-thirds in the fares took place. In order to place this more clearly before you, I will give an estimate based on the receipts of a line which would have as large an increase of traffic by a great reduction of fares as any line out of London—I mean the Brighton and South Coast Railway. The receipts for goods and passengers last year (1864) were £1,048,930, as nearly as possible $\frac{1}{30}$th of the entire receipts of all the railways in the kingdom in 1863, which was £31,156,217. The number of passengers carried was 13,525,000. The average fare from each passenger was 1·01s., and the average receipt per train mile for passengers was 4·62s., and for goods 10·2s., making an average per train mile of 5s. 5d., which was thus distributed: 2s. 11d. for working expenditure, 1s. 5d. for interest on loans and debenture capital, and 1s. 1d. for dividend or interest on the share capital

Now, Mr. Galt proposes to reduce the fares at once to one-third of the present rates. This, without any increase of numbers, would give 1s. 9¼d. (1·805) per train mile, 1s. 1¾d. less than the general working cost, leaving nothing for interest on loan capital, or for dividends. To obtain a revenue equal to that now received, assuming for a moment there will be no extra expenditure, the number

of passengers and the tonnage of goods must be increased by a number and quantity double those now carried. To simplify the question we will only consider its operation on passengers. The number now carried is 13,525,816, exclusive of season ticket holders, producing a revenue of £687,679; to this must be added 27,051,632, making a total of 40,577,448. I make no allowance for the extra expenditure connected with carrying and arranging every department of the railway for this immense increase of traffic, and which, judging from the gradual increase of expenditure which has followed the annual increase of passenger traffic from 1848 to 1864, or from 2,485,776, at a charge of £349,977, to 13,525,816, costing £687,679, could not be less than £430,000 per annum, and this, at the reduced rate of fares, would require the additional number of 24,206,437 passengers to make up the required revenue, making the total number to be carried to realize the same dividend to the shareholders 64,843,885, or per day 177,621, requiring about 5,000 carriages to carry them, and the total receipts £1,117,679 from passengers only. In this calculation no allowance is made for the enlargement of stations and extension of sidings required to accommodate such an enormous traffic.

Mr. Galt, arguing from the increase in the number of letters which followed the reduced rates of postage in 1839, asserts that in a few years the travelling public will so increase as to produce similar results on railways, but the country is to provide the deficiency until this great increase of receipts is attained, by additional taxation. As the revenue of the Brighton line in 1864 was so nearly 1-30th of the gross receipts of all the railways in 1863, let us apply the results obtained on that line to the whole railway system.

The entire number of passengers carried in 1863 was 173,605,485. This has first to be increased twofold or—
347,210,970 which added to
173,605,485 gives

520,816,455 as the number to be carried to produce the present revenue. To this is to be added a number which will produce revenue to pay for the extra locomotive power, carriages, and other expenditure, which cannot be less than 300,000,000 more, making a gross total of 800,000,000 of passengers to realise the amount received in 1863, and this is to be derived from nearly 30 journeys annually taken by every man, woman, and child in the kingdom. But if it will require twenty or twenty-five years, as in the case of the Post-office—the net revenue from which was reduced the first year from £1,683,000 to £465,929—before the present receipt is attained, a very large annual sum will have to be provided, and for many years, out of the consolidated fund to meet working expenses, besides that required for the payment of interest and dividends.

Are we, then, prepared for this immediate addition to our taxation for the benefit of the travelling public and the encouragement of trade by carrying merchandise at less than the actual cost of transit?—in fact, giving a bounty to travellers on business and for pleasure, and to commerce at the expense of the community at large. Do Mr. Galt and Mr. Chadwick sufficiently appreciate the difficulty of passing annually, through the House of Commons, a vote of several millions to make up this deficiency?

But let us see on what basis the calculation of the great anticipated increase of traffic depends.

I will again quote from the Brighton accounts, which are given in admirable fulness:—

1. Since 1848, the mileage of this Company has increased from 52 to 243¾ miles, or 467 per cent.

2. The miles run have risen from 904,625 to 3,213,356, or 350 per cent.

3. The expenses have risen from £147,132 to £447,453, or 304 per cent.

4. The number of passengers has increased from 2,485,778 to 13,528,886, or 524 per cent., but per train mile only from 2·75 to 4·2.

5. The receipts have scarcely doubled, being as 1·965 is to 1, although the average fare per person is now but 1·01s., against 2·94s. in 1848.

The result of this vast increase of accommodation to the public has been to increase the dividend from £3 12s. to £5 per cent.; or with 4½ times the mileage, 3 times the expenditure, 5½ times the number of passengers, the dividends have only increased £1 8s. per cent. in sixteen years, and this is the result obtained from fares Mr. Galt says are 66 per cent. too high.

What would be the prospect of the Brighton shareholders of a dividend for the next 16 years if the fares were now to be reduced from 1·01s. per head to 4d.? Is there any fair probability that the traffic would increase, on the existing mileage, from 13,500,000 to 64,800,000? or is it not more than probable that there would be an annual loss of from £300,000 to £400,000 per annum, which multiplied by 30, the proportion the receipts on the Brighton line bear to those of the whole railway receipts, would give a sum of £10,000,000 or £12,000,000 per annum on passenger account alone, to be provided out of the consolidated fund. Mr. Galt (p. 187) admits that the loss, by his proposed reduction of fares, could not be calculated at less than £5,000,000 per annum, an absurdly low estimate, and suggests that this is to be provided for by an addition to the income tax.

I would ask, which would the public prefer—to pay a fair rate when they use railways, or to submit to an extra 6d. in the pound income tax, to enable the travelling and pleasure-seeking public and merchandise to be carried, for many years to come, under cost price?

This is the result which would probably arise from reducing all fares indiscriminately to one-third the present rate, and from adopting Mr. Galt's uniform rate. But what during this period will be the state of our existing lines, and what will be the progress of railway construction? Existing lines will necessarily be starved, and every department will become less efficient; and as every new line would only increase the annual loss, construction would be stopped, and railway enterprise would be brought to a dead lock. (Preface, p. 30).

Mr. Galt, however, anticipating these objections, states that new lines, when required, would be constructed by the Government at one-third the cost of the old lines, a proposition which Mr. Chadwick also adopts. Mr. Galt is very fond of one-third. By his statement fares are two-thirds too high, and this is followed by another, that the cost of the construction of the lines is two-thirds too great, a happy coincidence of figures; but where this two-thirds is to be saved in the construction any more than in the annual expenditure we are not informed. Let us refer to the cost of a metropolitan line, the North London for instance:—

Land and compensation cost	£681,250
City Extension ditto, about	£1,200,000
Construction, plant, and machinery	£620,708
Rolling stock	£208,272

Where will Mr. Galt save his two-thirds out of these figures? Will the Government buy land cheaper than companies, or will compensations be lighter? Will the engineers do their work better, or lay out the lines more economically? Will contractors work more cheaply for Government, and to the extent of 66 per cent.? And will our great mechanical engineers sell their engines cheaper, or the carriage-builders their carriages and waggons cheaper to Government than to companies? Do the inquiries before Parliament show that Government obtains better and cheaper work for its money than companies or individuals? I believe the real state of the facts to be that individuals are best served—that well managed companies are next—and that the Government is exposed to more jobbery, bad work, and dilatory management than either. In proportion as the chief authority is accessible, and is exercised with

vigour and promptness, so is work efficiently performed; and it must be evident to all that Government does not, and I believe cannot, fulfil this condition. Here I will quote a passage from Mr. J. S. Mill, to whose opinion Mr. Galt attaches great value:—"As regards retrenchment," he says, "it is certain that, chiefly through unskilful management, great sums of money are now squandered for which the country receives no equivalent in the efficiency of its establishments, and that we might have a more useful army and navy than we now possess at a considerably less expense."

But besides the advantages to be derived from economy in construction, we are likewise to have great economy in management.

Pensioners are to be employed in requital for military service. If this is to produce economy it can only be by paying them less wages than the present class of railway servants now receive, but as the work would be the same, this would be an odd mode of requiting military services, or of obtaining better service; but did any one but Mr. Galt ever hear of the economical management of a public department as compared with a private establishment? It would indeed be more useful, and correct many erroneous notions now entertained by the public, if Mr. Galt, before he advocates placing railways under a governmental department, would point out one in which the same service is given for equal remuneration, as the public now obtains from railway officers. Then troops and warlike stores are to be carried with greater rapidity and efficiency; but can Mr. Galt give us any instance of greater regularity and efficiency combined with cheapness than the Brighton Railway Company displays in carrying the volunteers and sight-seers to Brighton on Easter Mondays? and did not the Government of the day seek the assistance of one of our most energetic railway contractors to help it out of a great difficulty during the Crimean War?

We are also told that the mails are to be carried with safety and despatch. But where is the risk and delay now complained of? I have already referred to the marvellous punctuality of the London and North-Western, and to the fact that the government has given up the mail-packet service to public companies.

But there is one source of economy in the annual expenditure of railway companies referred to by Mr. Galt which deserves notice, and that is the conversion of all the railway capital into a government stock, the interest thereon being secured by the State.

It may be assumed that government could borrow the £400,000,000 at the same rate of interest it now pays on the £800,000,000 of the national debt. At 90, Consols pay 3·33 per cent. £400,000,000, converted into Consols at 90, would be equal to £440,000,000, bearing interest at 3·33 per cent. Assuming then that in dividends, interest on guarantee and preference shares, &c., the average rate per cent paid on this capital of £400,000,000 is now 4½ per cent., and that, as Mr. Galt fancies, the public would willingly exchange the one for the other—that is, would agree to reduce their income by more than 1 per cent.—then the annual saving would be £3,000,000. But, in order to induce shareholders at once to accede to the plan that the nation should become the owners of the railways, he proposes that they should be paid, as compensation for the certain increase of dividends to which they will be entitled year by year, such a bonus as the legislature may consider fit; and (page 307, § 13) he assumes that the legislature would offer such liberal terms as to induce the companies to accept government stock in lieu of their shares, and this liberal bonus he estimates at 12½ per cent.

In the first place, then, the debenture and loan capital is to be converted into 3 per cent. stock; and next, the share capital is to be converted in the same way, but with a liberal bonus, estimated at 12½ per cent., which Mr. Galt considers will induce the shareholders to give up their prospects of increased dividends in future. So that the public is to be saddled with the annual charge caused by this bonus, and also with the deficiency which must arise for many years between the receipts, at the reduced rate of fares, and the expenditure, less whatever saving there may be in giving railway share and debenture holders government security instead of railway security. But may we not here inquire whether there is any real difference between the security offered and that which the shareholders now possess? If the security be not good, the Government certainly ought not to adopt it and pay a bonus to obtain it. If it be so good as to justify the Government in taking it, and so likely to increase in value as to justify their paying 12½ per cent. to obtain immediate possession, then are shareholders wise in making the transfer and giving up their prospect of improved dividends? To compensate for this extra charge or bonus he estimates the saving from what he terms unity of management at 25 per cent., and a further large and decided economy he says would arise from the resumption —he ought to say assumption—of proper public rights over railways. As to the mode, however, of effecting such savings he leaves us as much in the dark as he does respecting the proposed reduction in the cost of construction; but by a subsequent paragraph I must assume the Government is in some way to obtain the increase in the value of property caused by railways passing through it, for he says a railway frequently pays in the improved value of land, even when it fails to pay its working expenses or cost of construction. This is a question of some import to landowners.

From a pecuniary point of view the whole system of these railway reformers is so preposterous that I will not dwell any longer upon it, but proceed at once to the last portion of my subject—the charges brought against railway management, as it was many years since and as it at present exists; but while Mr. Galt and Mr. Chadwick dwell at great length on the past expenditure by the great companies—citing the well-known Brighton, Great Western, and other contests—they do not state, as I think in fairness they ought to have done, how very much more cheaply all the Parliamentary railway business is now accomplished than it was during the period of those contests, nor do they mention the great advantage the public derived from them, an advantage not altogether dearly bought in the infancy of our railway experience, pitting, as it did, the most distinguished engineers of that day (Stephenson, Brunel, Locke, Rendel, and others) one against the other, and stimulating them, as well for their own reputation as for the benefit of their clients, to strive their utmost to improve upon each others' plans of railway construction.

If the management of our railways had from the first been under a Government Board, should we now have had our express trains running with marvellous punctuality and safety at forty miles per hour, our powerful engines, without which modern gradients and curves could not be worked, and which the Board of Trade inspectors have had forced upon them by the energy of our engineers, and the responsibility attending the introduction of which they would not have incurred had the decision been exclusively in their hands? I cannot then see one real practical object to be gained by this proposed transfer of the management of our great commercial enterprises from private to departmental control. There is no instance adduced to prove rapidity of action, ready appreciation of invention, or economy of management in public works by the Government, which can compare with the marvellous rapidity and perfection with which our railway system has been developed by private enterprise; and here, as a set off to the large Parliamentary expenditure charged against our great companies, let me say that the country would have lost millions had the introduction and completion of our railway system been delayed many years, as postal reform was delayed, by the opposition and inaction of the Government.

I have not yet referred to foreign railways, which Mr.

Galt informs us are constructed so much better and more economically than those in England, though he does not by any reference to facts and figures prove either of these assertions.

The speed—a great element of cost in construction, and specially in maintenance and working expenditure—scarcely exceeds 20 miles per hour, and the number of trains is very limited. Mr. Chadwick, however, states that speed does not materially affect economy of construction, and that the wear and tear on slow trains, stopping frequently, makes them most costly.

Then as to safety. Mr. Chadwick informs us that railway travelling in France is seven times, in Belgium nine times, and in Prussia sixteen times as safe as in England. In fact, he says there are no accidents on the lines in those countries, and he would wish us to believe the conditions are alike in all these countries. He takes no notice of the greater number of trains which run on our lines, nor of the high speed of our express trains. But what do French writers on railways say? The Baron de Janzi, writing on railway accidents, says, "I will show that upon our lines accidents are caused nearly daily by the bad state of way and material," and "by the insufficiency of a badly-paid and over-worked staff." He gives the particulars of various accidents, and assigns a cause for the inattention of the railway companies to the safety of their lines, which is no doubt the reason of Mr. Chadwick's ignorance on this subject. He says that "in consequence of the excessive tax on the press each journal depends on a financial society, whose interests are in common with those of the railway company. The railway companies make sure, therefore, of their indulgence and silence by granting free passes, &c." How, then, with such facts stated by a French writer, evidently well informed on the subject, Mr. Chadwick can state that the French lines are seven times more safe than ours, it is difficult to understand, for he must be aware that the fatal accidents on our lines with our numerous trains and high speeds are but 1 to 16,000,000 of passengers, and that the injured are but 1 to 521,000.

Next, as to fares. The fares on all the foreign lines for 100 miles (excluding Belgium) average—1st class, 13s. 1d.; 2nd class, 9s. 6d; 3rd class, 6s. 0½d.; those of the United Kingdom being, 1st class, 18s. 9d.; 2nd class, 12s. 6d.; 3rd class, 8s.; but to the foreign fares must be added a very heavy charge for luggage, which is weighed with great exactness, and every pound in excess of the allowed quantity is charged, and in Switzerland every pound has to be paid for. It is difficult, therefore, to compare the fares of our lines with those in other countries.

This, then, is the result of management by Government to which Mr. Galt wishes to lead us, forgetting, or perhaps not being aware, that foreign governments are gradually giving up their control over railway management, and transferring it to public companies. This, I am informed by Mr. Vignoles, is the case in Italy, Prussia, and Russia.

The following extract from a recent article on Italian railways, in the *Economist*, illustrates the result of governmental action applied to such undertakings. The Italian Government, before the introduction of railways, had the experience of every country in Europe, and yet we find that "the Government made railways where they were not necessary and neglected them where they were the first condition of improvement;" that "the Government made very injudicious bargains with railway companies," and that as a consequence "they are acting as rich and secure monopolists are apt to act, and take no pains to develop traffic by increased facilities."

There is still another point of view from which this proposed change must be examined. I refer to its political aspect. Had Government the control of our railways, all railway officials, like those belonging to the Customs, Excise, and Post-office, must be struck off the Parliamentary register, and the constituency of the country would be deprived of a large number of its most intelligent members.

On a fair consideration, then, of the whole subject, I am satisfied that the national advantages arising from independence of action by railway boards are numerous and great; that they are not to be annihilated except under pressing necessity, and certainly no such necessity is shown to exist. The love of change is alone visible in this new scheme. No economy of management is contemplated except that arising from the better terms on which Government could borrow money, counterbalanced to a great extent by the bonus to be paid to enable Government to obtain possession of our lines; whilst, on the other hand, it is proposed to place the heavy burthen of carrying passengers and goods at much less than cost price on the consolidated fund, to be borne by the country, by those who never travel as well as by those who do, the travelling public, the comparatively wealthy alone being benefited. Improved management is not the object of this change, for we are told by Mr. Galt (p. 216) that "the company's management, on the whole, is far superior to what we might expect if our railways were handed over to the Board of Trade." * * * And, again, that "the directors and managers of our railway companies are in general men of great experience; some of remarkable ability, and possess a most thorough practical knowledge of the most economical and effectual manner of conducting railway traffic." Yet this management is all to be changed, and a new and untried system introduced. Twenty-four out of some hundreds of our railway directors, to be approved by the Government, are to be selected by the existing boards, who with a political president and vice-president, and a permanent second vice-president, chosen by the Crown, are to have the direction of the whole of the railways of this country. It appears to me impossible that so unwise, so crude, so nationally mischievous a scheme can for a moment be entertained by Parliament. But while expressing these decided opinions, I am not prevented from looking with interest for the result of the inquiries of the Commission which has been appointed to examine into our railway management. I hope it may stimulate improvements and thus benefit the public. That the gradual reduction which is taking place in fares may continue we must all desire; and that by comparing accurately, and with a full knowledge of the subject, the charges of different companies, we may arrive at a more just incidence of fares appears probable; but I believe everything that can be done to increase accommodation, to ensure safety by enforcing greater punctuality than is common on many lines, to reduce the charges, and to apportion them justly, will be done as soon, and better, under the existing administration of our railways than if they were to be placed under the administration of a Government Board. I believe, even if I were to admit all the charges of extravagance Mr. Galt and Mr. Chadwick adduce, that the country has lost less by them than it would have done had the introduction and management of our railways been left to the Government; that the country would have been poorer by the delay governmental action would have caused than it is by the large expenditure of the railway companies; and that this expenditure has not been without its advantages, for it has been the means whereby science, intelligence, and enterprize of the utmost value have been brought most rapidly into action. It is easy to make the statements indulged in by the advocates for Government interference, but they overlook all the benefits derived from self-government, and all the notorious extravagance, delay, and jobbery in public offices. With this remark Mr. Chadwick certainly will not agree, for he is of opinion that nothing in public administration has even been known or ever suspected to be so bad as has notoriously prevailed in railway administration.

The main ground of interference, the extent of the income derived and expected to be derived from railways, makes it difficult to see where the supporters of departmental interference will stop. Mr. Galt states, and repeats over and over again, and bases many

of his arguments upon the statement, that the gross railway revenue will soon be £36,000,000 per annum —a sum equal to half the revenue of the country; but surely this is no justification for the interference he advocates, or why should not the Government undertake the supply of food, meat especially, the expenditure upon which is far greater than that paid for locomotion, or the supply of tea and sugar, or undertake our cotton and iron manufactures? If Mr. Galt's theory be correct, every one would then be benefited; only travellers will benefit by his railway propositions. If it be true that Government can conduct large establishments cheaper than individuals, and that this alone would justify its interference in our internal trade, then the supply of food, of tea and sugar, and the manufacture of cotton and iron from the very much larger annual expenditure on these commodities than on railway fares, affords a greater justification for the interference of Government; let us but once admit the principle of interference, we shall soon enjoy the blessings of a Government which will undertake the responsibility of providing the people with everything they require, borrowing capital, to conduct the business of the country, at a low rate of interest, but at the same time converting a free and enterprising nation—now requiring only the interference of Government to protect life and property—into a dependent people, too indolent to manage their own affairs, and preferring the slow monotonous action of government to the active exertion and free action of individual enterprise.

DISCUSSION.

Mr. Galt said he had been courteously invited by the Council of the Society to be present this evening, in order to hear and, if possible, to reply to the statements and arguments put forth in opposition to the proposal which he had laid before the public; and when he looked around him this evening and saw the large assembly of gentlemen so thoroughly well informed on all matters relating to railway management, he was certain the subject would be well discussed. The first question which it occurred to him to ask was—Has the Government of this country proposed to purchase the railways? Has Mr. Gladstone brought forward any financial scheme for effecting that purpose? Has there been any government announcement on this subject which should bring together such an assembly as he now saw before him to hear and discuss a paper on this question? So far from the Government having made any proposition of the kind—so far from the Chancellor of the Exchequer having done so on the part of the Government, Mr. Gladstone, in answer to an observation made by Mr. Monsell, when that gentleman brought forward his motion with regard to the Irish railways, replied emphatically, when the intimation was made that it might be desirable for a short time for the Government to take charge of the railways in Ireland, "Not for one single hour in any case, or under any circumstances, would the Government take charge of the railways." Then what was the meaning of the exceedingly able paper which they had heard on this subject? not less able for what was said than for what was omitted. What, he asked, was the meaning of all these arguments? Assuming that some one in high quarters had proposed—which he was not aware had been done—assuming that some proposition had been entertained by the Government, and taken up by the country, for the purpose of handing the railways over to the management of the Government, how would the matter stand then? He might be allowed, in the first instance, to refer to the numerous comments made by Mr. Hawes on his (Mr. Galt's) book, in which comments, he ventured to say, some of the most important points referred to in that work had, as he thought, been omitted altogether. Now, with reference to the observations made by Mr. Hawes, in the prefatory portion of his paper, he had said it was most extraordinary "the gradual change which is taking place in public opinion, with regard to the interference of government in the ordinary affairs of life;" and that "the old constitutional jealousy of government influence and patronage" was fast disappearing. If this was so in reference to the railways, it certainly did not arise from any action taken, or proposition brought forward by the Government itself, but simply and entirely from the feeling that had gone abroad throughout the country that the railways have become the highways of the nation, and that as such they ought not to be managed and worked by private individuals solely for their own benefit, and that therefore they should become the property of the State, and be managed not necessarily by the executive, but at least under such regulations as would confer the greatest benefit on the public. Was there, he asked, anything unreasonable in that proposition? And, on the other hand, was it reasonable that the whole of the vast traffic of the country should be regulated according to the pleasure of gentlemen, no doubt able men, but who had only the single object in view of advancing the pecuniary interests of their shareholders? He would now briefly notice a few of the principal points brought forward in the paper. With reference to the receipts of the railway companies from the public, they amounted last year to £34,000,000 in round numbers; next year they would probably amount to £36,000,000. He had proposed that there should be uniform rates established throughout the country, and that a reduction should be made to one-third of the present rates and charges. Assuming, for argument's sake, that were carried out, it was perfectly plain that it would be tantamount to a reduction of £24,000,000 of taxation to the public generally; if £12,000,000 only were paid instead of £36,000,000, and if they got the same value for one shilling that they formerly did for three shillings, no one could contest the assertion that a reduction of fares and charges to that extent was equal in value to a reduction of (for instance) the duties on tea and sugar to the same amount. A reduction in the price of coal was at the present time of as much importance to the general public as a reduction of the duty on any article of customs or of excise. Coal could be brought from the north of England to London at the cost price of something like 1s. 6d. per ton. It could be purchased at the pit's mouth for 6s. or 7s. per ton, and could, therefore, be sold in London, including all expenses, for something like 12s. or 14s. per ton. If this reduction in the price of coal were effected it would be the same to the public as a reduction of taxation to that amount. If, therefore, there were a reduction of £24,000,000 on the one hand, and if they were called upon to pay an income tax of £4,000,000 on the other hand, would not the nation be £20,000,000 the richer? There were one or two other points which he wished to impress upon his audience. The first was, the exceedingly low cost at which passengers could be conveyed on railways. Taking the prime cost, without regard to profits, first-class passengers could be carried 16 miles for a penny; second class, 25 miles for a penny; and third class, 40 miles for a penny, but under the present system differential charges were made throughout the whole of the kingdom. On our English railways fares varied from three farthings up to 3d. per mile on the same line, and the recent Board of Trade returns showed that the rates on the Great Western Railway differed to the extent of 30 per cent., for on one part of the line nearly 3½d. per mile was charged, and on another part about 2¼d., varying according to the power possessed of extracting these rates from the public. Were the directors of the railways to blame for this? By no means. It was their duty, looking at their peculiar position, to set aside the interests of the public in the matter of rates. They had but one object to look to, viz., the enhancement of the dividends to the shareholders. With regard to management, he thought Mr. Hawes should have

stated more fully than he had done what he (Mr. Galt) proposed on that subject. He had suggested that there were three ways of carrying out what he called "Railway Reform." The first was this:—The lines might be leased out by the Government to companies, and a certain tariff might be laid down, a uniform tariff throughout the country; and that would to a great extent carry out all that was necessary. What had that to do with government patronage or government management? The stock-jobbing system might still be carried on, which was good in its way. Another plan he had mentioned was that the country might be divided into three or four sections, as was proposed some time ago by the chairman of one of the great companies, and the railways could be amalgamated to that extent, whereby a great saving of expense could be effected. It must, he thought, be admitted that if the railways were purchased by the government and leased out to companies, and if low and uniform rates were adopted throughout the country generally, benefit must accrue to the public. The great object of some appeared to be to exclude government management and patronage, but he thought the public were at last getting a little wiser on these matters, and that there was a feeling abroad which evinced a determination not to show such a foolish dread of government interference as had formerly existed. We were, in fact, adopting in municipal matters the principles which he (Mr. Galt) advocated in reference to matters of general administration. The municipal authorities of Manchester had thought it politic to take the subject of gas and water supply into their own hands. The cry was, formerly, "If you encourage public companies you will have the benefit of competition." There were thirteen gas companies in London, but he doubted whether the public were particularly well satisfied with the results of the "competition," so-called, which was thus created, but which was in fact neither more nor less than a sham. What was the competition at the present time between the London and North-Western, the Great Northern and the Great Western Railways? It amounted to nothing. He agreed it was much better than the competition which formerly led those companies to run trains at express speeds at third-class fares, which were, in fact, ruinous; for what they then charged a farthing for would have been cheaply done at five farthings. The Post-office department had been referred to by Mr. Hawes, and he would give an illustration of what the working of the Post-office was twenty-five years ago compared with what it was now. At that period the Post-office acted precisely on the same principle as that on which the railway companies proceeded now. It was then, as now, a commercial monopoly, with only this difference in its working. At that time it was looked to as a mere matter of revenue. It extracted every shilling it could from the public so as to make the greatest possible amount of revenue; and many persons present recollected the annoyance that was experienced from the differential rates of postage, varying as the distances to which letters were transmitted. That system was changed. The Post-office was still worked by the Government as a source of revenue; but it was no longer a question of getting the greatest amount of return out of it, but under the system of a uniform rate there had resulted vast benefits to the whole community. He felt sure there was a public opinion abroad on the subject of railway reform, and they had only to point to the Act of Parliament of 1844, giving power of purchase to the Government, to know that redress was within their reach. In conclusion, he would refer to a curious coincidence. The last time he was in this room was more than twenty years ago, when he read, from the place now occupied by Mr. Hawes, a paper* advocating a similar plan to that which he now proposed. He thought they had made some progress since then, and he hoped before another twenty years elapsed they would have the railways—he did not say managed by the government—but public property, and worked for the benefit of the public, with a low and uniform tariff throughout the country; and that they would not be left to individual caprice and control in the direction of the traffic of the great highways of the kingdom.

* 1st May, 1844.—Ed. *J.S.A.*

Mr. Frederick Hill expressed his concurrence with many of the views brought forward by Mr. Hawes, and he agreed with many of the objections urged in the paper against the governmental management of the railways of the country. Although he was himself a Government officer, he did not think success would attend that plan. Mr. Hawes had made considerable reference to the department with which he (Mr. Hill) was connected, viz., the Post-office, and stated, as a matter of information to the meeting, that most of the appointments of that office were made from political considerations. He had the pleasure of stating that on this point Mr. Hawes was greatly mistaken, and that not a single appointment of importance in the Post-office had been made on political grounds. The appointments were limited to the service itself, and the Postmaster-General himself could not appoint any one out of the service unless he was in a position to represent to the Treasury that there was not sufficient honesty or ability in the department from which to make the appointment. As regarded the subordinate appointments, such had been the desire to concentrate the responsibility on the heads of those who ought to bear it, that all the appointments in the country offices of clerks and even letter carriers were made by the postmasters themselves. He therefore thought if the objections to Government management rested upon that basis, they were very feeble. The remark had been made that the great success of the Post-office depended very much upon the co-operation it received from the directors of the railways. He felt bound to say that, though the directors of many of the railways had shown great consideration and courtesy in meeting the demands made upon them, yet he demurred entirely to the statement that the success of the Post-office had been caused by the railways. It had always been the feeling of the Post-office that, so far from being favoured by the arrangements of the railway companies, it had always been at great disadvantage as compared with the system which obtained on the Continent. Take the cases of France and Belgium. In France the railways were not managed by the Government, nor were they at present public property; but they were in the position of leasehold houses in this country, and after a lapse of years they would revert to the state. But the conditions on which these long leases or concessions were granted were that the mails should be carried free of charge to the country, excepting only in cases of special service. In Belgium many of the railways were both the property of the state and managed by the government, and, in his humble opinion, they were exceedingly well managed too. In that country, also, the government, in respect of the lines owned by private companies, was in the happy position of having the mails carried free of charge. The consequence of that system was that the post offices were enabled to have more frequent postal communication between town and town than was the case in this country, densely populated as it was, compared with the continent. Under present circumstances the Post-office of this country could not give that accommodation to the public which it desired to afford, in consequence of the large payments made to the railway companies, in some cases exceeding the gross revenue obtained from particular mails. Looking, therefore, at all the circumstances, the Post-office was not beholden to the railway companies in the way that had been described; and although, in most cases, the ordinary charges of the railways were considerably less than was the case with the old stage coaches, yet in some instances, per hundred letters, they

paid more to the railway companies than was formerly paid to the mail coaches. Mr. Galt had correctly pointed out, that the majority of the statements in the paper were based on the assumption that an active government management of railways was about to be established in this country. He concurred with Mr. Galt that the management was no essential part of the plan proposed. For the railways to be the property of the State was one thing: their management by the government was another. It was thought by some that if the lines belonged to the State, instead of there being less competition than there was at present, there would be more. Other parties would be invited to take the management, the tariffs would be reduced to a rate sufficient to pay the expenses, and the country generally, in his opinion, would be much benefited.

Mr. John Hawkshaw, F.R.S., said, for his own part, he was not aware that the Government had proposed to purchase the railways of this country, and probably Mr. Hawes intended in his title to imply the *suggested* sale of the railways to Government. He was glad to hear from Mr. Galt and Mr. Hill that neither of those gentlemen entertained the idea of a governmental management of the railways, and he could readily imagine that the Counceller of the Exchequer dismissed any such proposition in the summary way which had been referred to by Mr. Galt. It was difficult, however, to imagine why the Government should be advised to purchase the railways unless with a view to control and manage them; and as far as he knew, Mr. Galt and those who agreed with him had hitherto advocated that Government ought to purchase the railways, not as a commercial speculation, but for the very purpose of controlling the management of them. For his own part he did not see much difference in the two cases. Whether the Government were to take the absolute management of the railways or the absolute direction of that management, it would lead to the same result, for if they undertook the direction they must be responsible for the management, and for the consequences which resulted from it. He did not believe that the Government of this country would do so unwise a thing as to purchase the railways. If the Government were expected to purchase the railways for the reasons given by Mr. Galt, he (Mr. Hawkshaw) thought the Government would of all bodies be the most unfitted for carrying out such an object. There were many reasons why the Government should not do this, but he would allude to one or two which were more immediately within his own knowledge. One statement in particular had been reiterated by those who advocated this proposition—viz., that the existing lines had been extravagantly made, and that future railways could be made at a much smaller cost. Now, as far as his own experience went on that point, he believed that statement to be quite fallacious. Railways could not now be made at a smaller cost than formerly, on the contrary, so far as he knew, future railways would cost more than past railways. All the elements of cost of which railways consisted were larger now than they were twenty years ago. Land was worth more, bricks and stone were higher in price, and the wages of labour were enhanced. There were one or two circumstances which led gentlemen not practically acquainted with the subject into this mistake. They were in the habit of comparing the cost of a modern railway made yesterday with the cost of an old railway like the London and Birmingham, made twenty or thirty years ago. Railways went on adding to their capital from the day of their creation. They began with a certain amount of sidings, lines of permanent way, and with stations of a certain magnitude, but from his own experience of railways, the cost of their stations quadrupled in twenty years, the increasing traffic of the country necessitated this, and from the same cause more powerful locomotives and a larger amount of railway stock had to be provided. This was considered a fair addition to capital. It was erroneous, therefore, for the purposes of comparison, to take a railway just opened with a minimum of accommodation, with rolling stock only sufficient to start work with, and to compare it with a railway which had been twenty or thirty years in operation. One important point advocated by Mr. Galt was the getting a large reduction of fares, and then establishing a uniform rate all over the country. He (Mr. Hawkshaw) could not imagine a proposition more unsound than that. Would Mr. Galt say if he (Mr. Hawkshaw) choose to make a railway, on which he offered to convey merchandise and passengers at a lower rate than his "uniform rate," that he ought not to be permitted to do it? because, if that were so, he could not see what good purpose this proposition would lead to. But it meant something worse than that, viz., that there should be no difference between retail and wholesale prices. Did Mr. Galt mean that there should be a universal price per yard for calicos all over the country? that the Manchester warehouseman who sold thousands of pieces per day should sell his article at the same price as the man who sold half a dozen yards at a time? for if his principle was right in this matter, that was what it amounted to. There were places on railways where they could, on certain articles, get an average load of 200 tons, and because they could get that average load per train they could afford to carry the goods at a very low price per train mile; but there were other places and cases where they could not get average loads of more than 25 tons. What was to be done in such cases? Was the charge to the man or the district where they had 200 tons per train to be governed by the rate which was paid where they could get only 25 tons per train? The argument of Mr. Galt would be that in both cases they must carry at the same rate. And then, again, supposing he made a railway of such form and with such arrangements that he could carry average loads of 500 tons per train, was the public to be debarred from the advantages which could be given by the carriage of such large quantities? It would seem to him that Mr. Galt's principle was contrary to all the laws which governed trade. On the question of average loads he wished to say a word or two. There was an absolute law which rendered it impossible materially to alter the average loads on any railway. Take, for example, the London and Birmingham line. The average load of merchandise—speaking approximately—used to be about 58 tons, it was now, probably, 70 tons. The average load on the Lancashire and Yorkshire used to be only 30 tons per train,—it was now probably raised to 35 tons or 40 tons per train; and they could not alter this. It was beyond the control of railway managers and statisticians. It arose from the simple circumstance that the exigencies of trade required them to send from each particular town trains at certain times in the day. The consequence was, every particular portion of a railway had a service to perform which was governed by these exigencies over which they had no control, except they adopted the despotic system which existed abroad, and which he was surprised to hear spoken of with favour in this room. If they wanted to go between two great continental capitals the railway company gave them two trains a day, and no more; and, no matter how urgent the case was, they could not go in the intervals. Having, then, only these two trains per day they obtained a large average load; whereas between London and Liverpool and Manchester they had eight or ten trains per day, and the consequence was that the average load was reduced. If they were willing to adopt the continental system, of a very limited number of trains, then he had no doubt Mr. Galt could make a considerable sum of money at his reduced rates; but the thing was utterly impracticable in this country, where people liked to travel when they pleased. He would say a word with respect to Mr. Hill's observations. That gentleman had the good sense to see that govern-

ment management of railways was utterly out of the question, and his proposition was, not that the Government should manage the railways, but simply purchase them, and leave them to companies to work and manage them. He (Mr. Hawkshaw) would take this opportunity of saying he could not imagine anything more calamitous than that. Railway companies might be bad enough now, but the moment they were made lessees of the Government, it would be their interest to get as much out of the Government as possible. When, moreover, it was put in their power to vote for or against the Government in political matters, the door was opened for "fleecing" the Government to an extent nobody could calculate. He considered the function of the Government was to examine as often as they pleased into the management of railways, and suggest whatever they thought necessary for the welfare and safety of the public and the due discharge of their duties by the companies. There was, moreover, one incalculable mischief which would arise from the Government having the control of the railways. Everybody knew that all the railways constructed during the last ten years were pure speculations. They knew that the Government would not undertake speculations of that kind, and the first effect of putting the railways under their control would be to stop extensions. He had heard a great deal said on other occasions about "useless railways." Now, he did not know, speaking from a public point of view, of a single useless railway having been made in this country. There was no such thing as a useless railway. He had occasion to prove, and he did so successfully, before a committee of the House in 1851 or 1852, that at the time when the Lancashire and Yorkshire line was paying 2½ per cent. to the shareholders, it was paying to the district through which it passed, at least 3 per cent. upon the entire capital of the company. The public were getting as large dividends from the railways as the proprietors themselves. He was the more anxious to state these views because he was one of those who believed that railway companies would, if they could do so, sell their railways to the government at once if they were offered a sufficient price for them. Therefore we must not rely upon the companies themselves for protecting the public from what he believed would be a great evil. But he was sure no government would ever buy the railways; if they did, it would be the most retrograde step they had ever taken.

Mr. Charles Stuart Barker said much had been said about the Post-office, which seemed to be an establishment suited to be quoted in support of Mr. Galt's views, but nothing had been said with respect to other public establishments—such as the Government dockyards; and he asked whether the management of those establishments would bear favourable comparison with the present management of railways. Mr. Galt had put forward a proposition which was very plausible on the face of it, and they might be all agreed upon it if he could show how it could be carried out—more particularly the reduction of prices he had spoken of; but he had not pointed out whether he proposed to reduce the original cost or the working expenses, or whether he proposed to effect his object by means of more efficient management. They all knew that the railways of this country were under the management of gentlemen of large experience, who had devoted a great part of their lives to the acquisition of knowledge which adapted them for the posts they occupied. He had hoped Mr. Galt would have pointed out in what way he proposed to reduce the rates—whether by reduction of the original cost, or of the working expenses, or by more efficient management. If gentlemen would give some information on those points it would assist the meeting in coming to a right conclusion on the subject before them.

Mr. Edwin Chadwick, C.B., said there were various points in Mr. Hawes' paper to which he should be glad to address himself, but he felt that the hour was too far advanced to enter upon them that evening.

Mr. Thomas Webster, Q.C., F.R.S., suggested that it would be a good plan to adjourn the discussion to a future evening, when perhaps Mr. Chadwick would reopen the subject by reading a short paper.

Mr. Chadwick expressed his willingness to do so, and the discussion was then adjourned to a future evening to be fixed by the Council.

Fine Arts.

Organisation of Art in Belgium.—The Belgian Government has created a new functionary in connection with the Fine Arts; his duties will be to advise the authorities on all matters relating to Art submitted to him by the Minister of the Interior, and especially with regard to works to be executed by order of the Government; to superintend the execution of public works of Art; to visit and report upon Art Exhibitions; and to execute whatever commissions the Minister may judge useful in the interest of Art. M. Van Soust de Borkenfeld, lately chief of the bureau of the Beaux Arts under the same minister, is appointed to the new and more important office.

Proposed Picture Exhibition in Paris.—M. De Nieuwerkerke, the Superintendent of the Fine Arts under the Imperial Government, proposes to have an Exhibition in the capital of the principal pictures belonging to the various public galleries in the provinces. These galleries contain many fine specimens of the French school, and would doubtless make an interesting collection; moreover, it would be a return for like services rendered by Paris to the departments.

Imperial Courtesy to Artists.—The young artists who, having won the great prizes of the academies at the late competitions, are about to depart for Rome, dined the other day with the Emperor and Empress at St. Cloud. The Count de Nieuwerkerke, superintendent; M. Courmont, director; M. Robert-Fleury, chief of the School of Fine Arts; and M. Auber, the Director of the Conservatoire, were present.

Manufactures.

Artificial Ivory.—The *Mechanics' Magazine* says that the process by which the most successful imitation of natural ivory is obtained appears to consist in dissolving either india rubber or gutta percha in chloroform, passing chlorine through the solution until it has acquired a light yellow tint, next washing well with alcohol, then adding, in fine powder, either sulphate of baryta, sulphate of lime, sulphate of lead, alumina, or chalk, in quantity proportioned to the desired density and tint, kneading well, and finally subjecting to heavy pressure. A very tough product, capable of taking a very high polish, is obtainable in this way.

Commerce.

Bituminous Oil in Gallicia.—M. Felix Foucon, a French geologist, has recently made a tour in Gallicia, and has since made a communication to the Paris Society of Civil Engineers respecting the sources of mineral oil in the region of the Carpathian mountains, proving, according to the views of M. Foucou, that Europe may, when she pleases, compete advantageously with America in the production of this important material. The region visited by M. Foucou was that part of the Austrian Empire which

lies on the northern slope of the western chain of the Carpathian mountains, and extends from the Hungarian frontier to the Cracow and Lemberg railway. The deposits in this neighbourhood are already worked on a small scale, and they are supposed to supply the means of ascertaining the probable extent of the supply in that part of Europe. The mineral oil of Gallicia is found in strata of schist and argillaceous earth more or less impregnated with hydrocarbon. The carburetted deposits mark the eocene period, ceasing towards the north where the miocene deposits commence. In the latter, salt takes the place of bitumen; and M. Foucou says that the petroleum region is circumscribed with great precision by the salt region which extends from Wicliczka, near Cracow, across the two Gallicias and Bukovine, to the principalities of Moldavia and Wallachia. M. Foucou notes the coincidence of the bituminous deposits with the existence of resinous trees, and gives as instances that on the Hungarian slope of the western chain of the Carpathians, where there are few fir trees, petroleum only exists in an exceptional condition; that on the side where the bituminous schist is found the mountains are thickly covered with firs, and on the contrary, where the clay appears alone, scarcely any but beech trees are to be found. If this be not an accidental coincidence, it is a valuable index to the searcher after mineral oils. During the discussion which took place after the communication made by M. Foucou, it was stated that according to M. Elie de Beaumont's pentagonal system of mountainous formation, the petroleum deposits discovered in Alsace, and those of Avallon, in the department of the Yonne, and in the environs of Autun in the Saone-et-Loire, which have been worked with success for thirty years, are not connected with those of the Carpathian mountains, but seem rather to form part of a larger and more important geological circle, which extends from the mouths of the river Amazon, in America, marks the limits of the valley of the Upper Danube, and joins the chain of the Ural mountains.

Colonies.

Trade of New Brunswick.—The annual report of the Comptroller of New Brunswick shows that the imports last year were valued at 8,945,852 dols., and the exports at 5,053,897 dols. New Brunswick trades with almost every country. The largest trade is done with Great Britain, to which she last year exported goods to the value of 2,732,733 dols., not including ships, and imported from the United Kingdom to the extent of 3,598,125 dols. The trade with the United States is second in extent and value. Last year New Brunswick exported goods amounting to 1,266,148 dols, and imported goods to the extent of 3,316,824 dols. Nova Scotia comes third. Exported last year 555,924 dols., and imported 1,360,342 dols. Exports to Canada 60,004 dols.; imports from thence, 245,020 dols. Exports to Prince Edward's Island, 112,728 dols.; imports from thence, 85,261 dols. The gross revenue of New Brunswick last year was 1,060,815 dols., which is the largest total ever yet reached. The number of vessels registered in the province at the end of 1864 was 958, of 233,225 tons; 570 of these (185,700 tons) are owned in St. John's. The number of vessels registered or built for owners abroad, and not registered in 1864, was 163, of 92,605 tons. The estimated value of the shipping owned in New Brunswick is £960,000, or 4,800,000 dols., and of the vessels built last year £738,000, or 3,667,500 dols.

Torres Straits Postal Route.—With regard to the question of steam communication between India and Australia *viâ* Torres Straits, it appears that in January of the present year a letter on the subject was addressed, by the Netherlands Consul in Brisbane, to the Minister of Foreign Affairs at the Hague, pointing out the numerous advantages to be gained by the Dutch settlements in the East Indies from their being placed in direct communication with Australia. The subject seems to have been taken up warmly both in Rotterdam and Batavia. A company has been formed, which is to enter into an agreement to run a monthly steamer between Batavia and Sydney, calling at Kupang, Timor, Cape York, and Brisbane; leaving Batavia on the arrival of the English mail there, should the Governments of Netherlands, India, Queensland, and New South Wales be willing to subsidize them for the service to the extent of £38,400 per annum. For this concession it is proposed to run paddle-steamers of sufficient power to average 12 miles an hour, and capable of carrying 600 to 800 tons of merchandise, with cabin accommodation for 40 to 50 passengers of the first class, and 60 to 100 second and third class.

Obituary.

George Richards Elkington was born on 17th October, 1801, at St. Paul's-square, Birmingham. He was the patentee of the electro-plating and gilding processes, which he introduced commercially in the year 1840, and so rapid was the application of the principle to the manufacture of all kinds of articles, that from the small beginning of perhaps a score of persons employed by Mr. Elkington in the first instance, the firm which he founded now employ upwards of 1,000 persons, and the trade has become one of the most important in his native town, where he may thus be said to have been the founder of an entirely new branch of industry, giving employment directly and indirectly, throughout the United Kingdom, to probably not less than ten thousand persons. His great enterprise and good taste have no doubt largely conduced to place the products of his works in the high estimation in which they are universally held. He was an extensive exhibitor at all the great international exhibitions, and never failed to carry off a large share of the medals and rewards that were obtainable. Though always desirous of encouraging native talent in all branches of his trades, he was still obliged to admit that in designing and modelling this country has still much to learn from the French, and he has, consequently, always employed both French and English artists in those departments. He was well known to be always ready to adopt any improvements in machinery, so much so that any new methods of accomplishing any of his processes of manufacture were generally at once offered to him by the inventors, and his works at Birmingham now comprise all the leading improvements, and are among the standard attractions of his native town. He was also extensively engaged in copper smelting and coal mining operations in South Wales, employing several hundred workpeople, which businesses, as well as those carried on by him in Birmingham and London, in connection with which he was more generally known, will now be continued by his sons. His kindness of manner, just dealing, and unostentatious liberality were proverbial, and his death has been universally regretted. His death was caused by paralysis, and took place at his residence, Pool Park, Denbighshire, on the 22nd September last.

Lovell Reeve, F.L.S., F.G.S., was born on Ludgate-hill, on the 19th April, 1814, his father carrying on business as a draper and mercer. At the age of thirteen Lovell Reeve was removed from school, where he had distinguished himself, and bound an apprentice to a grocer, also on Ludgate-hill. A sailor spread out some shells on the counter of the grocer's shop, and offered them to the apprentice for sale. The glittering specimens tempted him—the boy purchased them—and from that hour Lovell Reeve became a conchologist. In his occasional holidays he visited the docks, and sought out the sailors who had shells for sale, and thus he

added to his collection. In 1833, Lovell Reeve obtained a week's holiday, and attended the third meeting of the British Association. Here he attracted attention, and accompanied, as conchologist, an exploring expedition, which was planned into the fens between Cambridge and Ely. When his seven years of apprenticeship expired, Lovell Reeve, armed with letters of introduction, went to Paris, and made the acquaintance of M. de Blainville and other naturalists. At a meeting of the Academy of Sciences a paper written by him, on "The Classification of the Mollusca," was read. On returning to London, he produced his "Conchologia Systematica," in two quarto volumes, with 300 plates of shells. A small sum of money left him by his father was expended in the production of this work. In 1843 he opened a shop in King William-street, Strand, for the sale of objects of natural history, and the publication of works on conchology. He now commenced his great work, "Conchologia Iconica." In this he was greatly aided by the magnificent collection of Mr. Hugh Cuming. Of this work 250 numbers, forming 15 volumes, have appeared, illustrated with 2,000 plates. In 1850, appeared "Elements of Conchology: an Introduction to the Natural History of Shells, and of the Animals which form them." Mr. L. Reeve wrote the descriptions of the new shells for the "Zoology of the Voyage of the *Samarang*," also the conchological appendix to Sir Edward Belcher's "Last of the Arctic Voyages." The last published work by Mr. Lovell Reeve was "On the Land and Freshwater Molluscs, Indigenous to, or Naturalised in, the British Isles." Mr. Lovell Reeve was elected honorary member of several continental and American learned societies, by reason of his exact conchological knowledge. Of late years his sufferings have been severe, yet up to a very short period before his death he contemplated pursuing, in new directions, his favourite studies. He died in Henrietta-street, on the 18th November, in his 51st year.

Notes.

Gun Cotton.—The Vienna correspondent of the *Times* says:—"By order of the Emperor the use of gun-cotton by the Austrian artillery and corps of engineers is prohibited. If the cotton now on hand cannot soon be sold it is to be destroyed. A few years ago forty batteries of eight guns were made, all of which were to be charged with gun-cotton instead of powder, and now they must be re-cast."

Pharaoh's Serpents.—On the poisonous character of these serpents, Dr. Stevenson Macadam writes:—This chemical toy is composed of a highly poisonous substance, called the sulpho-cyanide of mercury. The material is a double-headed poisoned arrow, for it contains two poisonous ingredients, viz., mercury and sulpho-cyanic acid, either of which will kill. Experiments have been made by me upon the lower animals, and I have found that one-half of a sixpenny Pharaoh's serpent is sufficient to poison a large-sized rabbit in an hour and three-quarters. A less dose also destroys life, but takes longer to do so. The toy, therefore, is much too deadly to be regarded as merely amusing; and seeing that it can be purchased by every schoolboy, and be brought home to the nursery, it is rather alarming to think that there is enough of poison in one of the serpents to destroy the lives of several children; and the more so as the so-called Pharaoh's serpent is covered with bright tinfoil, and much resembles in outward appearance a piece of chocolate or a comfit. I hope that the rage for the Pharaoh's serpents will die out in Edinburgh without any disastrous consequences, though such have occurred in other places; but it is certainly an anomaly in the law of the kingdom that a grain of arsenic cannot be purchased except under proper restrictions, and that such articles as Pharaoh's serpents, containing as deadly a poison, may be sold in any quantity, and be purchased by any schoolboy or child.

New Geographical Society at Boston.—A new society, for the propagation of geographical knowledge, is reported to have been formed very recently at Boston, in the United States of America, by public subscription. The amount collected is said to exceed a million of dollars, and the undertakings proposed are of great importance and magnitude. The managing committee or council of the society includes scientific men, manufacturers, and politicians. It is proposed to send expeditions to various countries, and to publish the reports received at a very cheap rate, so as to form a popular library of geographical information. It is said that the society has four vessels ready to leave New York in December.

Adult Education in France.—The Minister of Public Instruction, in a circular referring to classes for adults, says that the number established in France last winter, by the teachers in the primary schools, amounted to nearly eight thousand, and received in all nearly two hundred thousand students. These courses include, besides the ordinary elements of education, applied geometry, linear drawing, and ornamentation, the history of France and the elements of hygienic, chemical, and legislative science. These adult classes are now being rapidly extended over the empire.

Streets Named after Artists and Men of Science.—In the last list of the changes made in the nomenclature of the streets of Paris, the following names appear:—Architects and engineers:—Pierre Lescot, Chalgrin, Riquet, and Perronet (founder of the School for the Education of Engineers in Road and Bridge Work). Painters and sculptors:—Prudhon, Gros, Flandrin, and Ramey. Physicians and naturalists:—Blainville, Thouin, Linnæus, Duméril, Hallé, and Ollivier de Serres. Writers:—Sauval, Ville-pardouin, Alain Chartier, Vaugelas, La Fontaine, and Le Maistre. Musicians:—Berton, Nicolo, Spontini, and Pergolesi. Jurisconsults:—Debelleyme, Cujas, Pasquier, d'Argenson, and Nicolaï. Amongst the rest are the names of Legendre, the geometrician; Philippe de Girard, inventor of a method of spinning flax; those of several generals, including Turenne, d'Hautpoul, Haxo, Petit, Pagol, Curial, Lecourbe, and Lourmel (who fell at Sebastopol); Boissy d'Anglas; Sibour, Archbishop of Paris; and the late Count de Morny. In most cases the streets are in the locality in which those after whom they are named resided.

Correspondence.

Gas Explosions.—Sir,—The inquest held upon the fatal explosion at Nine-elms, comprising as it does the report of Dr. Letheby, one of the best authorities in regard to the chemistry of coal-gas, affords very valuable information to the public as well as to gas manufacturers themselves. Dr. Letheby has assured the public, what is well known to all scientific men, that coal-gas, or carburetted hydrogen, is perfectly inexplosive when unmixed with a certain proportion of atmospheric air, and this property is proved every time a gas-burner is lighted, by the fact that that act never causes an explosion; whereas, if one of our large gas-holders were filled with a mixture of one volume of coal-gas to nine or ten of common air, and ignited, the explosion would lay a considerable portion of the metropolis in ruins. Fortunately, however, such a thing can never take place, because there are no means by which common air can enter the gas-holder. The one omission which the public may complain of is, that no explanation was afforded during the inquiry as to how the instantaneous lighting of the governor could give rise to such an escape of gas as to fill so large a building with the explosive mixture. The meter-house was 79 ft. by 39 ft., and 23 ft. high, containing upwards of 70,000 cubic feet. The fact

appears to be, that a leakage of gas must have been going on for a period long antecedent to the accident with the governor, undiscovered, owing to the great height of the meter-house—twenty-three feet. This fact further proves that the meter-house was not properly ventilated, for it is evident that if there had been no roof or ceiling to the building, no gas could have been accumulated, and of course no explosive mixture formed. Coal-gas, though of much greater specific gravity than pure dry hydrogen, is still much lighter than common air, and will readily rise with great rapidity, as is proved by our modern system of ballooning with coal-gas, instead of, as formerly, with pure hydrogen. The recommendation of the Court—that the governors of gas-works should be completely secured from unskilful interference, is not at all calculated to render this special kind of accident impossible, because circumstances may occur—such as repairs, &c.—when the governor might be for a time quite unprotected. All explosions in gas-works may be rendered impossible, notwithstanding leakages to any amount, by either having no roof at all to the building, or, if rain and weather must be kept out, having that roof so constructed that it shall be a ventilator throughout the whole of its surface; and if there must be a ceiling, for the sake of appearance and tidyness, it should be lathed only and not plastered. If painted or whitewashed, it would only appear from the floor, to be a ceiling with a pattern on it. Buildings so arranged will be proof against explosions of any kind occasioned by leakage of gas. But the ventilation must be thorough, and not according to such miserable plans as we see commonly adopted in some of our large theatres, court-houses, and buildings for holding public assemblies.—I am, &c., Henry Reveley.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Arts, 8. Cantor Lectures. Mr. G. W. Hastings, LL.D. (Lecture II.) "The Effects of the Discovery of the Precious Metals on Modern Civilization."
Odontological, 8.
British Architects, 8.
Medical, 8. Dr. Broadbent, "Cases illustrative of the effect of Hæmorrhage into different parts of the cranial nervous centres, with an attempt to explain the exemption of the abdominal, facial, and other muscles from paralysis in the common form of Hemiphlegia."

Tues. ...Geologists' Assoc., 7.
Anthropological, 8.
Civil Engineers, 8. Continued Discussion upon Sir Charles Bright's paper, "The Telegraph to India, and its Extension to Australia and China."

Wed. ...Society of Arts, 8. Mr. Henry Fitz-Cook, "On the Graphotype, a Process for Producing from Drawings Blocks for Surface Printing."
Geological, 8. 1. Mr. E. B. Tawney, "On the Western Limit of the Rhætic Beds in South Wales, &c." 2. Rev. P. B. Brodie, "Notes on a Section of the Lower Lias and Rhætic Beds near Wells, Somerset."

Thurs ..Linnæan, 8. 1. Mr. H. Muller, "On some Climbing Plants in S. Brazil." 2. Dr. Masters, "On Double Orchids." 3. Mr. Dalzell, "On the genus *Moringa*." 4. "Dr. L. Lindsay, "On *Arthonia*."
Chemical, 8. Dr. Gladstone, "On Pyrophospho-triamic Acid."

Patents.

From Commissioners of Patents Journal, November 24th.

Grants of Provisional Protection.

Ashes from cinders, apparatus for separating—2867—J. L. Hancock.
Blast, furnaces for heating—2897—T. Whitwell.
Blasting, boring, and cutting hard rock, tools for—2774—J. Bernard.
Boilers, steel cylinders for—2529—H. A. Bonneville.
Boots and shoes, socks or inner soles for—2910—D. A. Jones.
Breaks—2927—J. Williamson, J. Lindley, and J. Coleman.
Cane, &c., producing papermakers' pulp from—2922—W. R. Lake.
Cannon, apparatus for working—2869—W. E. Newton.
Cartridges—2906—J. Millar.
Cooking, washing, and ironing, apparatus for—1917—W. Wapshare.
Cotton, &c., preparing and spinning—2476—W. Tatham.
Door locks, latches, &c.—2889—B. Pitt.
Door springs—2917—W. Williams.
Drums or pulleys with their shafts, connecting—2933—W. Clark.
Engravings, preparing the surfaces of paper, &c., for receiving, and for rendering them fire and waterproof—2891—W. E. Newton.
Fire-arms and projectiles—2902—C. W. Jones.
Gas meters, wet—2893—E. Myers.
Gas stoves—2934—S. L. Gill.
Gun locks—2743 - F. H. Grey.
Heavy bodies, apparatus for moving—2931—T. A. Weston, J. Tangye, and R. Chapman.
Hydrocarburets, purification of—2945—W. Clark.
Iron, refining - 2929—J. Dixon.
Lime, &c., scattering—2846—A. Jemmett.
Meat, &c., preserving—2919—W. Fox.
Metals, making amalgams or alloys of—2903—W. E. Newton.
Metals, plating or combining—2842—E. J. Northwood.
Metronome—2899—H. C. Carden.
Millstones, ventilating—2924—H. E. Newton.
Mortices in wood, &c., bit for boring—2857—W. T. Hamilton.
Moulds, stoves for drying—2943 - H. Cochrane.
Paper pulp, steeping or treating—2574—W. Clark.
Paper, treating vegetable fibres used in making—2882—G. A. Ermen.
Photographic lenses—2937—W. Bunger.
Pipes, regulating the flow of water in—2905—J. A. Nicholson.
Portfolios, &c.—2918—J. Stephens.
Portfolios, &c., locks or catches for—2939—G. Chambers & G. Gregory.
Railroads, crank axles of locomotives for—2908—W. R. Lake.
Railways, permanent way of—2932—T. Dobie.
Railways, supplying cattle with food and water on—2900—W. Reid.
Reaping and mowing machines—2875—W. Manwaring.
Regulator or dial, self-acting—2890—J. E. Avy.
Rosaniline, producing blue and violet from—2894—E. T. Hughes.
Roller skates—2770—R. B. Sanson.
Safety lamps—2370—H. A. Bonneville.
Shafts and axles, rolling—2904—A. V. Newton.
Steam boilers, heating the feed water for—2920—J. H. Whitehead.
Stone, &c., crushing or reducing—2913—G. H. Goodman and E. Bow.
Submarine electric telegraph cables—2941—A. Wells and W. Hall.
Timber, cutting—2923—J. J. Long.
Traction engines—2234—S. L. James.
Truck or barrow—2848—W. Brett.
Vessels, attaching and detaching sails of—2777 - J. Murray & C. Wells.
Vessels, feathering the paddles of propellers for—2944—J. Goodier and J. F. Kilshaw.
Vessels, preventing from sinking—2851—T. Page.
Weaving, looms for—2843—A. Heald.
Wood, embossed—2895—A. V. Newton.

Invention with Complete Specification Filed.

Railway carriages, stopping or retarding—2942—L. A. Vedu, F. H. and L. E. A. Fosse.

Patents Sealed.

1441. T. H. Hoblyn.	1497. F. N. Gisborne.
1456. R. A. Brooman.	1503. W. J. Burgess.
1457. R. A. Brooman.	1505. H. Allman.
1458. R. A. Brooman.	1506. H. Allman.
1469. P. Young.	1512. H. Mallet.
1470. H. Sen.	1515. H. Allman.
1471. E. Myers and J. Stodart.	1519. W. Gadd and J. Moore.
1472. W. Johnson.	1522. F. J. Bolton & H. Matheson.
1473. F. A. Paget.	1531. C. de Bergue.
1475. W. T. Hamilton.	1548. H. H. and J. F. G. Kromschroeder.
1481. J. Jopling.	1577. W. H. Harfield.
1484. B. Lawrence.	1738. H. P. Tipper.
1487. J. Calvert.	1778. G. Low.
1489. T. Spencer.	2279. T. T. Ponsonby.
1490. T. A. Browne and J. Knight.	

From Commissioners of Patents Journal, November 28th.

Patents Sealed.

1482. W. Martin.	1518. R. A. Brooman.
1508. T Brinsmead.	1543. A. I. L. Gordon.
1510. F. Knight.	1552. G. Haseltine.
1511. T. Hunt.	1578. G. E. Meek and W. H. Howes.

Patents on which the Stamp Duty of £50 has been Paid.

3127. J. Townsend.	3168. T. Fletcher.
3136. J. Taylor.	3174. J. R. Danks, B. P. and R. P. Walker.
3230. G. F. Blumberg.	3176. J. Halford.
3155. W. Tatham.	
3193. W. Clark.	

Patent on which the Stamp Duty of £100 has been paid.

2662. R. H. Hughes.	2772. R. Legg.
2672. F. C. Calvert and C. Lowe.	

Registered Designs.

Apparatus for Corking Bottles—November 9—4753—Farrow and Jackson, 16, Great Tower-street.
A Cartridge Loader—November 11—4754—Hanbury Barclay, Oakfield-cottage, Edgbaston, Birmingham.

Journal of the Society of Arts.

FRIDAY, DECEMBER 8, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'clock:—

December 13.—"On London Milk." By J. Chalmers Morton, Esq.

December 20.—"On Parkesine, its Composition, Manufacture, and Uses. By Owen Rowland, Esq.

Cantor Lectures.

Owing to the state of Mr. Hastings' health the two Lectures announced for Monday evenings, the 11th and 18th inst., are unavoidably POSTPONED till after Christmas, and will be delivered on Monday evenings the 15th and 22nd of January.

The tickets already issued will be available on these evenings.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

Second Lecture.—Monday, December 4.

The Effects on the Discovery of the Precious Metals on Modern Civilisation. By G. W. Hastings, Esq., LL.D.

The following is a summary of Mr. Hastings' lecture:*—There is a striking analogy between the operation of the forces which mould the surface of the earth and of those which affect the progress of human society. Geological periods of quiescence and disturbance may be traced in succession, giving rise to new continents, new climates, new physical conditions, producing new races of animals and plants. Social conditions are subject to similar mutations, no doubt regulated by laws equally binding and ascertainable. Long periods of repose are followed by convulsion, giving birth to new states of society and fresh forms of government. A striking illustration is to be found in the irruption of the northern tribes into the Roman empire, which broke up the long tranquillity of the civilised world, and gave rise to the various nations of modern Europe. The habit of migration, one of the most powerful of the moral forces of society, though arising from a strictly physical cause, the pressure of population on subsistence, was the lever of that mighty change. When the flood of conquest settled down, European society emerged under altered conditions, and, amongst others, with respect to the supply of the precious metals. The drain to the east, with a stationary or diminishing production, had reduced their amount in the latter days of the empire, an effect immensely increased by the general hoarding consequent on a period of disturbance. The scarcity of silver and gold during the early part of the middle ages is sufficiently proved by the high price of those metals; a small silver coin being an ordinary fine, and the salary of an important officer of state being hardly equal to the wages of a domestic servant of the present day. The trade of the Lower Empire and that of the Venetians and Genoese seem to have produced little effect on the supply, and there is no doubt that the amount afloat towards the end of the fifteenth century (estimated at thirty-four millions), was insufficient for the wants of the new civilisation that had sprung up with so much vigour on the ruins of the old. The consequence, at a later date, would have been inconvertible paper money; in mediæval times the debasement of the coinage was an equivalent resource, and practised systematically in some countries, as in France and Scotland. But a new physical force became known and used, magnetism applied to navigation in the compass; the sphere of European energy was enlarged to the habitable globe, and civilisation received a new impulse. From the discovery of America in 1492 to 1545, the amount of the precious metals imported into Europe was about 28½ millions, and without apparent effect on prices. In 1545 the great silver mine of Potosi was opened, and the amount imported in the much shorter period between 1545 and 1573 was estimated at 64 millions. The effect of this influx was a rise in prices, in other words a fall in the value of the precious metals, as proved by many records, public and private, of the time. In 1574 the process of obtaining silver by amalgamation with mercury was discovered, which was followed by a still greater influx of the commodity, and still further depreciation in value. Towards the end of Elizabeth's reign the change in the value of money began to be seriously felt, both by individuals and by the revenue of the Crown; and there can be little doubt that the impoverishment of the Crown, owing to this cause, was one of the prime moving forces of the political struggles in the succeeding reigns, with their consequences to the Constitution of the country. The distress experienced at this time by the labouring population, evinced by the enactment of a poor-law, and by their clamour for legislative regulation of prices and wages, was owing to the same cause. It has been most wrongly attributed to the dissolution of monasteries, an event which must have tended to mitigate the evil by throwing land on the market and fostering enterprise; and the fallacy is conclusively shown by the fact that Spain, of all countries the most conservative of medioeval monasteries, suffered at precisely the same time from similar inconveniences. About 1770 another considerable rise in prices took place, referred to both by Hume and Adam Smith, though without adequate appreciation of its real cause, viz., the constant supply of gold and silver during the 18th century, till towards its close they were being flung on the market (and strictly as articles of commerce, the supply for currency purposes having reached saturation point) at the rate of more than seven millions yearly. The great war, however, caused a diminution of the supply, the subsequent revolutions in South America ruined the mines, and for a time the trade collapsed. It is remarkable that this was just the period of the suspension of cash payments, and that when, after the period of disturbance, British capital was applied to Mexican and Peruvian mining, and the supply rose, cash payments were resumed. If other conditions had remained the same, no doubt this renewal of the supply of the precious metals must have led to another rise in prices, but it was about this time that one more of the great physical forces which propel civilisation was added to the resources of mankind. The expansive power of steam, already applied to manufactures, was utilised for the purposes of locomotion by land and water;

* In the summary of the first lecture, at line 30 from the end, for "north-eastern," *read* "north-western."

the intercommunication of mankind, and the migration of the European race, which had received a vast impulse from the application of the compass, were still more energetically promoted; the increase in the number of civilised communities and the general expansion of trade, caused a demand for specie which more than counterbalanced the supply; the constant agitation for a paper currency, and other signs, make it a probable surmise that the amount of the precious metals afloat in the market (while Europe was dependent on South American production alone) was becoming inadequate to the demand. But at this time occurred one of those events which are landmarks in history; for the first time since the destruction of the Roman Empire the nations of Europe witnessed the discovery of gold near to their own doors. The slopes of the Ural mountains were found to be prolific in the metal, and science had an opportunity of studying its geological conditions. Sir Roderick Murchison, whose travels in the Russian dominions gave him peculiar facilities for accurate observation, mastered the problem of gold discovery so completely, that he prophesied the finding of Australian gold-fields before an ounce of the metal had been seen in that continent. A knowledge of the probable sites of gold led to search, and in California, Australia, New Zealand, and other countries, diggings are now in operation which have raised the annual supply to at least forty millions. Now, taking Humboldt's calculation of 400 millions as the amount thrown into Europe from the discovery of America up to the date of the recent supplies, the question is—what is to be the effect of so startling an addition as that which can double the total in ten years? It may be well to note, first of all, the actual effects which have followed. Precisely as the search after the precious metals in ancient times led to the colonisation of the shores of the Mediterranean to their remotest points, and the consequent spread of civilisation and new political ideas, so now the coasts of the Pacific, north and south, are being peopled, in a great measure from the same cause, by a vigorous race, who carry with them over the globe the principles of self-government and international comity. An immense increase in trade and industrial production of all kinds, adding daily to the accumulated wealth of the world, and thereby to the independence, comfort and happiness of millions, is another result; one which no doubt would equally follow from an addition to wealth in any other form, but which as a fact does follow from gold discovery more rapidly than from any other known cause.* Further, it is no small benefit that an impulse has been given in all civilised countries to the establishment of a sound currency, by which is meant a currency whose real value is equal to its nominal value; and to the discrediting of expedients of currency deterioration, such as in mediæval times led to debasement of the coinage, and find their modern equivalent in the delusions of inconvertible paper money. That there has been a rise in the prices of ordinary commodities around us needs no demonstration; but how far this is owing to any fall in the value of the precious metals is another question, and one which can only be fully answered by the future; but the local nature of the rise in many cases must suggest doubts, seeing that any real fall must, in the present state of intercommunication, operate pretty equally over the whole European market. M. Chevalier, in his able work on gold, predicted that a change in value quite as great as that which happened in the sixteenth century would be the result of the new supply, and he has uttered an emphatic warning to his own Government and other nations. In this volume he described France as the parachute which was breaking the fall of gold, on account of the temporary demand made for that metal by the French Government during the substitution of gold coin for silver. Looking to the date of Chevalier's work, and the subsequent teaching of experience, it is impossible to resist the observation that the parachute is a long time coming down. In fact, M. Chevalier seems to have underestimated the various retarding influences, several of which are quite as potent as the change in the French coinage. No doubt the fluctuation in relative value produced by gold discoveries is great, even enormous, when applied to limited areas, because in such cases there can be no fresh demand adequate to balance the sudden and inordinate supply;* but in the market of the world the want of one district drains the abundance of another, and gold, like water, finds its own level. Why did not prices rise between 1492 and 1545? Because the twenty-eight millions imported only filled up the vacuum previously existing, only slaked, as it were, the thirst of European commerce. No doubt so soon as the saturation point had been reached, the further supply at once began to tell, and with what results we know; but there are many causes which will retard the reaching of that point at the present day. France is not the only country in which gold is being substituted for silver for currency purposes; our Indian empire will long create a demand, and there are States in Europe, such as Austria, which are almost destitute of a metallic medium. The extension of public works, such as railways, in so many parts of the world keeps up a demand for specie, and it is difficult to exaggerate the effect of the present increase of trade, manufacture, and population in so many quarters. There is also a self-acting check on gold production which has been too much overlooked; all the best gold fields are situated at a considerable distance from Europe, and in thinly-populated countries, where labour is in great demand; consequently, a very moderate depreciation in the value of that metal will suffice to bring down the remuneration of the diggers' labour below the rate of wages earned by manual work around them, and, therefore, to check the supply. Under any circumstances it may be considered certain that no sudden shock will be felt, and that the evils of change of value will be consequently mitigated. In connexion with that part of the subject, the soundness of Adam Smith's opinion that it did not matter whether the precious metals were of high or low value, may be questioned. If they are of high value, or in other words if their amount is small relative to other commodities, that value is likely to be disturbed by every discovery, however slight in its nature, of any new supply; whereas, if the amount in the market be large, that is if their value be low, a small increase will not operate to any appreciable degree, and even a large increase will be much less felt.† It is satisfactory to reflect that the evils of the change, whatever it may be, are temporary, while the good effects of gold discovery remain; that the results of stimulated enterprise, enlarged commerce, extended colonisation, increased industrial production,

* That is, if as large and rapid an emigration had taken place to the Australian settlements for the purpose of growing wool and cotton, and an amount been produced equivalent in value to the gold that has been mined, the results to the wealth of the world would have been the same. But no such emigration did or would take place. We must not overlook the moral forces of society. The elements of hope and imagination under certain circumstances overpower the dictates of reason and the calculations of the economist. The *auri sacra fames* has often furnished an illustration.

* As in the instance mentioned by Strabo of the effect caused in his own time on the prices of Italy by the discovery of some gold diggings on the south slopes of the Alps. The almost total disorganisation of the labour market in Australia, which for a time ensued on the gold discoveries, is still more remarkable.

† Chevalier's arguments in favour of the substitution of silver for gold as the standard, are based on the supposed greater fixity in value of the former metal. But can this be relied on? The production of silver depends in a great measure on the price of mercury; and the recent discoveries of large deposits of mercury in California and the adjacent Mexican provinces suggest the probability of a largely-increased supply of silver.

do not pass away, but that their benefits are reaped fifty-fold in the happiness of future generations. If, too, there is a similarity between the consequences of the discovery of the precious metals in ancient and modern times, there is also this blessed difference, that in the times of antiquity the mines were worked by slaves, and thus every new discovery added to the sum of human suffering, whereas now the diggings are worked by free labour, and all the social results that follow are in favour of the prosperity of the artizan classes. In fact, a great social upheaval is fast taking place, and comfort, even luxury, physical and intellectual, is spreading through the bulk of the population. It may therefore with truth be said, as was stated at the commencement of the first lecture, that the record of the progress and results of the discoveries of the precious metals would form, if a history of civilisation were to be adequately written, one of its most interesting and important chapters.

FOURTH ORDINARY MEETING.

Wednesday, December 6th, 1865; Henry Cole, Esq., C.B., Vice-President of the Society in the chair.

The following candidates were proposed for election as members of the Society:—

Ashbury, John, 27, Great George-street, Westminster, S.W.
Bikélas, D., 19, Old Broad-street, E.C.
Blackburn, James, Droylsden, Manchester.
Booth, J. P., Bellevue-house, Cork.
Cursetjee, Manackjee, Hill-house, Southampton.
Ellis, Edward, 9, Fenchurch-street, E.C.
Hindley, D. P., 10, Old Jewry-chambers, E.C.
Laycock, William E., Portobello-place, Sheffield.
Maxwell, Nicholas M., 4, Allhallows-chambers, Lombard-street, E.C.
Nash, Arthur Briscoe, 25, Cornhill, E.C.
Nixon, Joseph, 104, Fore-street, E.C.
Palmer, George Harry, 2, Middle Temple-lane, E.C.
Robinson, A. A., 137, Fenchurch-street, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Allen, Matthew, 61, Tabernacle-walk, E.C.
Barfoot, Edwin, 32, St. Martin's-le-Grand, E.C.
Barry, Herbert, 57, Old Broad-street, E.C.
Bowker, James, 1, Gray's-inn-square, W.C.
Brook, William Pitt, 1 and 2, Poultry, E.C.
Brooks, William Cunliffe, 81, Lombard-street, E.C.
Brown, John, 15, Rolls-buildings, Fetter-lane, E.C.
Carttar, C. Graham, 7, Skinner's-place, Sise-lane, E.C.
Dewnay, Archibald Davis, 58, Campbell-road, E., and 11, Park-street, Westminster, S.W.
Dickinson, George Francis, 17, Gracechurch-street, E.C., and Farleigh House, Surbiton, S.W.
Dornbusch, George, South Sea House, Threadneedle-street, E.C.
Evans, Charles John, 5, Princes-street, Bank, E.C.
Harris, Rev. Charles, Summer-town, Wandsworth, S.W.
Hart, John Walter, 60, St. Mary Axe, E.C.
Harwood, Edward, jun., 33, Abchurch-lane, E.C.
Hellaby, Joseph, 122, Wood-street, E.C.
Henshaw, William, 2, Sun-street, Bishopsgate, E.C.
Hibbert, Edward, 7, Jewry-street, E.C.
Langton, Rivers, 15, Laurence Pountney-lane, E.C.
Masters, Joseph Reynolds, 78, New Bond-street, W.
Morley, Henry, 4, Frederick-villas, East Brixton, S.
Nash, Alfred George, 13, Basinghall-street, E.C.
Nickisson, John Charles, 16, Watling street, E.C.
Overend, William, Q.C., 6, Queen's Gardens, Hyde Park, W.
Parker, Josiah, 44, St. Paul's Church-yard, E.C.
Price, Frederick Wakefield, 31, Upper Seymour-street, W.
Smith, S. T., Rivers Commission Office, 2, Victoria-street, S.W.
Vernon, Hon. A., Sudbury-hall, Derby

The Paper read was—

ON THE GRAPHOTYPE, A PROCESS FOR PRODUCING FROM DRAWINGS, BLOCKS FOR SURFACE PRINTING.

By HENRY FITZ-COOK, Esq.

The subject of art-processes for the reproduction of drawings, both for surface printing and otherwise, has occupied much of the attention of this Society during the last twenty-five years, and been the occasion of many interesting discussions in this room, but none of the processes professing to make blocks for surface printing have gone so direct to the point of making the drawing engrave itself as the one I am about to describe, or have at all approached it in economy, both of time and cost.

Most of the previous processes, such as Glyphography, Gypsography, Silvertype, &c., have aimed at making the drawing form the mould from which the block was to be cast, entailing very great uncertainty in the execution of the drawing, and requiring the artist at the same time to be a skilful engraver to produce any satisfactory results. a great portion of the block being produced by the ordinary methods of engraving.

In the directions to artists working in Palmer's Glyphography—really the most successful of all surface processes hitherto—there appears the following passage:—

"As the light and free touches that are sometimes dispersed over the shades, are very troublesome to leave, and, when accomplished, are often stiff and formal, they should be altogether removed from the drawing, and put in with the graver upon the copper block. Nearly every kind of broad, flat shade, (technically known as tinting among wood-engravers), can very readily be done in this stage of the process, which, indeed, will be the best for almost all work needed upon the darkest tones."

Again, further on, the artist is invited to leave "skies and backgrounds solid black, lay an etching ground on the block, etch and bite it in with acid, as a copper-plate engraver would do, but with this difference, that while he bites for darks, you must bite for lights," thus rendering the work doubly difficult to any one but an engraver.

Others have sought to place the drawing in relief by biting away the ground with acid. It is obvious, however, that to get the relief necessary for printing at press, the acid would have a lateral action, and the fine lines, at all events, be rotten for want of support. In fact, either the want of depth, or of the V form of the interstices between the lines—the form necessarily made by the graver—has been the stumbling-block of all processes hitherto, though most of them have been capable of producing some good results, as specimens, with the aid of subsequent graver work; and probably, had the inventors been practically acquainted with engraving, the processes might have been made of some commercial value.

There is also one other process for producing a surface print, but as it is not capable of being printed by the ordinary type machine, it hardly comes under the category of a surface block. I allude to the Anastatic process which has lately been further developed in Col. James's Art of Photolithography. In these processes the drawing or photograph is transferred to the stone or zinc by the rolling press, which of course has a tendency, even in the most careful hands, to squeeze out and therefore thicken the lines of the drawing; but though beautiful results have been obtained in the process of photolithography by Osborne and one or two others, the cost must always be a serious obstacle to its general adoption.

Artists engaged in drawing for engraving have long felt the want of some easy and direct method of reproducing their works without the impress of another hand. The cleverest engraver, with the utmost exercise of his skill, can at best only produce an approximation to the

original, too generally losing entirely the points which the artist has laboured most successfully to produce; and only the artist himself can tell how great is the shortcoming.

We constantly hear it said in defence, that "the engraver often improves upon the drawing." To my mind there can be no greater condemnation of the practice of engravers; and, though doubtless true, as regards very inferior works, I venture to say it is never the case with a real work of art, which must of necessity suffer in the translation.

The Graphotype process, to which I have to call your attention, is absolutely free from most of the objections which have been urged against previous methods. Gravers would have to be cut on purpose to make an engraving equally deep. Undercutting or any other than the V-form, would be a mechanical impossibility. The marvellous economy of time—the drawing being placed i relief, or engraved, if the term may be allowed, in le minutes than it would take hours to engrave the san subject on wood—in that respect resembling the intagli process of Mr. George Wallis—as well as the triflin cost of execution—must lead eventually to its very gene ral adoption, whatever present objection may be urge against it from its novelty.

I have a drawing here (Fig. 1) which is ready for en graving, and when it has been examined it will b engraved, that you may note the time taken in it execution. A drawing is also being made for me (Fig. 2 which will be engraved and hardened, before the presen meeting is concluded, and printed with the paper in th Society's Journal. I have also a piece of machine rulin (Fig. 3) now being executed, which will be similarly en graved and printed. The print I have in my hand (Fig. 4)

Fig. 1

and of which any one may take a copy, will, I think, sufficiently prove its suitability to the roughest form of steam printing; but in case any one should doubt whether it may not have required extra care or time to make ready, I have here the answer of Mr. Trounce, the Society's printer, to the question. He says:—" I forward the copies of your block and title-page. I hope they are sufficiently well printed for your present purpose. Had we been less busy we should have printed them in a somewhat better style; sundry defects, which you will not fail to discover, be good enough to attribute to the fact of our being unable to bestow as much tim on the 'bringing-up' as is usually devoted to cut The block itself presents no difficulty whatever, in my opinion; and, what is of no little value, though of a nega tive character, I have not heard from the machinist th slightest hint of a difficulty. I have purposely use ordinary book-work ink; and I have no doubt that at a hand-press, and with wood-cut ink, work quite equal t that from the finest wood-cuts could be produced from blocks by the Graphotype process."

Unlike most of the other processes which have bee

discussed by this Society, the discovery of the principle on which the Graphotype process is based was not the result of design or calculation, but entirely accidental and unpremeditated. It is due to Mr. De Witt Clinton Hitchcock, one of the foremost draughtsmen as well as engravers in the city of New York.

In the summer of 1860, whilst engaged in the pursuit of his art, the discovery was made in the following manner:—In the course of making a drawing on box-wood, he found it necessary to alter a portion of his design by erasing it and re-whitening the exposed surface of the wood. The material used for this purpose was the enamelled surface of an ordinary visiting card, softened by water and a brush, a method known to most draughtsmen on wood. This card happened to be one printed from a copper plate, and after the removal of all the enamelling, as described, the artist discovered that the printed letters were undisturbed, and standing up in bold relief.

Mr. Hitchcock undoubtedly was not the first or only draughtsman who had used a card in this way or with the same result, but it must be conceded that he was the only one who perceived in this mutilated visiting card the basis of a mode of producing a relief printing-plate, without the skill of the engraver, and who proceeded to experiment thereon.

FIG 2.

The first trial was upon a piece of chalk one inch in thickness, sawed from the ordinary lump, and smoothly surfaced by scraping. The ink used was silicate of potash, commonly termed liquid glass, coloured with indigo; with this and a quill pen, a drawing four by six inches was made.

The inventor well knew that the application of water to his chalk block would undermine the lines, and consequently destroy the drawing, he, therefore, departed from the method used with the visiting card, and, with the aid of a tooth-brush, pulverised or disintegrated the surface of the chalk not immediately drawn upon.

The lines of the drawing being literally composed of stone, withstood the assault of the tooth-brush, but the intervening particles of exposed chalk succumbed, and vanished in a cloud of snowy dust, leaving the impregnable lines standing in relief, inviting a proof of their strength by printing on paper. This could not be done until the whole mass of chalk was changed into stone, by saturating it with the liquid glass, and in half-an-hour the chalk engraving or block was inked and printed in the ordinary way on paper by burnishing.

Sawing and surfacing the chalk block, preparing the ink, making the drawing (quite an elaborate one), brushing it into relief, petrifying the block, and printing thereon occupied only four hours—a happy four hours for the inventor.

The new process now needed a name. It was a living fact, but the dead languages must be exhumed for its appellation. It was christened Graphotype, literally signifying a type made immediately from a drawing.

Prior to a second experiment it was thought necessary to use a substance of a finer and more uniform quality of grain than common lump chalk, so a cake of French white powder, used by ladies for improving their complexions, was obtained, and the result was highly satisfactory. The fact that these cakes of white beautifying powder were compactly formed by hydraulic pressure suggested a valuable improvement to the process.

No time was lost in manufacturing the necessary steel dies or boxes, and procuring the use of a powerful hydraulic press, with which blocks 12 inches square by 1 inch thick were formed of pulverised and finely-sifted chalk. These blocks were then subjected to a heat of 700 degrees, which, expelling all moisture, gave them much greater strength. The drawings on these blocks were made with steel and quill pens, and the brushing process for relieving the lines was carried to the depth of one-eighth of an inch. These blocks were printed at the ordinary hand printing press, but the material, though very strong, was too fragile and uncertain for constant use.

The next necessary improvement was to duplicate the original by means of stereotyping or electrotyping. The latter proved perfectly practicable, but alterations or corrections of the design—which I need hardly tell you must necessarily often occur in any process—all of which could readily be done on the stereotype, could not be satisfactorily made through the copper surface of the electrotype, notwithstanding Mr. Palmer's directions on the subject already quoted. Valuable improvements were the result of this new addition to the process. It would be tedious to listen to an account of all the experiments which followed this alteration—the disappointments, hopes deferred, and discouragements from friends which the inventor suffered for the space of eighteen months.

Great difficulties arose; the labours of a month were often lost in a minute, and steps retraced to the first principle, which stood always unchanged; its constancy was beyond suspicion. The ink line, once drawn, remained unalterable, and ever ready to reward the operation of brushing, and this portion of the process has never been altered.

In making the stereotyper's moulds from these blocks, they were found to absorb too great a quantity of oil; the new block, or, more properly, the new plate, was then composed and adopted, and has been in use without material alteration to the present time.

It was a well-known fact that the silicious ink spread on the plate, and produced a line somewhat thicker than was drawn. This was certainly detrimental to the process, but the existence of the fault could not be denied, for as the chalk was naturally porous it would absorb the ink laterally as well as vertically. It remained for a brother artist of the inventor, a Mr. Day, to make the improvements required in the graphotype drawing ink now so successfully used. I may also mention that Mr. Edward Roper, a London engraver, materially aided in improving the practical details of the process; and no doubt its success is to be attributed to the fact that none but those practically acquainted with art or engraving have been connected with its development.

With the approval of the original inventor, the European patents were granted to Mr. Day, and I will now give a general description of the whole process, as specified in the letters patent:—The best quality of French chalk is finely ground and precipitated in water. This precipitate is again pulverized and sifted. Thick sheets of zinc or other metal are cut to the required sizes, upon which the prepared chalk is re-sifted through wire cloth having 10,000 holes to the square inch. This

is subjected to hydraulic pressure of 120 tons, the chalk receiving a gloss from the surface of a highly polished steel plate. In this condition the thickness of the zinc plate and compressed chalk is about that of an ordinary stereotype plate. The surface of the chalk is then made nearly non-absorbent by receiving a strong 'sizing,' which prevents the ink from penetrating, and, consequently, from spreading.

The ink, which, as I have said before, took two inventors months of labour to perfect, is, after all, nothing more than a very careful composition of glue and lamp-black; and, partaking as it does of the nature of varnish, it remains upon the surface, acting merely as a guard or protection to the chalk beneath the lines while undergoing the operation of brushing. In a like manner to drawing upon wood, the artist makes a red chalk tracing on the plate, and with sable hair pencils of various sizes draws his design line for line exactly as he desires it to appear when printed, the subject being of course reversed, as upon wood. The ink, which is black, dries instantly on being applied to the plate, so that one series of lines of any thickness may be immediately crossed by others.

The drawing is now ready to be brought into relief, or engraved, which is effected by the same means of disintegration as were first adopted by the inventor, not with the same tooth-brush, but with brushes composed of fitch-hair. Fine silk velvet is also used in connection with the brush. The chalk is then petrified with the liquid silex, and is ready for the stereotyper, who may, without injury to the original, make from it any number of moulds.

The process is so delicate that the impression of the thumb wetted with the graphotype ink, skeleton leaves, feathers, and other objects to which nature printing has been applied, can be made to give beautiful impressions from the type press, whilst the finest hair-line that the artist can make will stand equally well with the bolder work.

The graphotype process is also applicable to making

Fig. 3.

This plate was delivered to the artist ruled; the drawing, which took two hours to make, was exhibited in the room; it was engraved in fifteen minutes, stereotyped in three hours, and it required one hour's engraving to put in the "high lights."

the blocks or dies—usually cut on brass—with which the bookbinder embosses the covers of his books, and this conclusively proves, if anything were needed to do so, the depth obtained by the process, as at least three times the depth is required for this purpose as for printing at press.

In mechanical drawing the graphotype process cannot at present compete with other methods, inasmuch as the compass and rule are incapable of being used without damaging the chalk surface, and the absence of these aids very materially increases both the labour and cost of the drawing. This difficulty, however, no doubt will be speedily overcome when any one shall think it worth while to lay himself out for it. That mechanical work can be done well and quickly even at present, where cost is not a consideration, is proved by the engraving published in the *Journal* of the Society for the 13th of October, and in confirmation thereof I cannot do better than read the note appended to it by the Editor of the *Journal*:—"This illustration is one of the first applications of a new process for producing surface blocks from a drawing. It has been produced for this Society as an experiment. The drawing was placed in the hands of the artist on Wednesday morning, and the metal blocks, ready for the printer, were delivered the following day. It is right to state that, the drawing being of a geometric character in outline, the difficulty of production was greatly increased. It should be added that the drawing, having been placed in the hands of a wood engraver of eminence on Tuesday morning last, was returned by him with the statement that it was impossible to execute wood blocks in time for this week's *Journal*."

This engraving, however, produced without any preparation under such adverse circumstances, is not, of course, put forward as a specimen of what graphotype can do. The specimens exhibited in the room show far better evidence of its capabilities, though even they fall far short of exhibiting the full range of its power.

The ordinary engravers' ruling machine—by an ingenious adaptation, which you will have an opportunity of inspecting at the close of the meeting—is rendered available to this process for producing quiet water, flat skies, broad tints, and other purposes to which it is applied in steel engraving. In this case the line, instead of being ruled by a point, is made by a metal wheel, which touches but does not press upon the surface of the chalk. There is also a little arrangement for gradually feeding the wheels with ink.

As a matter of interest to the members and visitors present it now becomes necessary to say a few words on the manipulation of the drawings. When the process was first introduced to me I saw at once that the problem so long and anxiously sought had at length been solved, and though I had never previously made a line drawing with the brush—which, during the last four or five years has nearly superseded the pencil for drawing on wood—the first attempt I made confirmed my previous conviction. Since then, I have secured the co-operation of some of our best illustrators, Holman Hunt, J. D. Watson, Du Maurier, Morten, Hablot K. Browne, Florence Claxton, and others, whose first attempts are in the room for your inspection. None of them have, I believe, experienced any difficulty other than the strangeness which must necessarily attend the working on a new material, and most of them are enthusiastic at the results of their first trials.

Mr. Holman Hunt writes me as follows:—"I regard the process of drawing for book illustrations, called graphotye, with which 'Watts's Hymns' have been illuminated, to be the best yet adopted. The merit of the modern wood-cutters is very great, and the care which they bestow upon the blocks they cut deserves, oftentimes, the greatest thanks of the designer of the work; but, even under the most favourable treatment by the cutter, much of the original character of the drawing must necessarily be lost. Your new invention will preserve every peculiarity of style. A first experiment is scarcely a fair test of the capability of the process, but it has convinced me that when the tools are familiar to the draftsman he will find a means of expressing his ideas which he never had before except in etching on metal, which of course cannot be used in type printing."

Mr. Hablot K. Browne says:—"As far as I have tried the graphotype process, I like it very much, as it certainly has this advantage over ordinary wood-cutting—that it renders the artist's drawing more faithful."

Mr. J. D. Watson writes:—"I am much pleased with the result of my first trial in the graphotype process. It is certainly superior to anything I have seen. It remains to be seen how it will bear rough printing. I should like to see a good book with large drawings done in this way."

Mr. T. Morten also writes thus:—"I have not yet had the pleasure of seeing the complete work for which I did the graphotype drawing, but as far as my own experience of the process goes, it would seem to have several advantages over any existing method of illustration—for instance, the possibility of complex work being engraved with greater rapidity and at less cost than by the method now in general use."

I have also tested the process myself with every kind of execution which occurred to me, and found no practical obstacle to any. There is no greater difficulty in drawing on the chalk with the brush, than there is upon paper. It is as susceptible of after-touching and improving as the wood block, and is as well adapted to free, bold, sketching as to great elaboration; results can be obtained with ease such as no engraver can attempt, and new instances of its practical application and development are occurring, and must continue to occur every day. I feel confident, therefore, that when it becomes practically well-known, no real artist will care to submit his work to the tender mercies of the engraver, whilst he can have it so faithfully reproduced by these means.

To the author and publisher it not only opens the present means of saving half the cost of engraving—ultimately a much larger proportion—with the additional advantage of retaining the actual work of the artist he employs—but it will also enable works to be produced which could not otherwise have been undertaken. In periodical publications, its rapidity of execution, I have reason to know, will shortly work a great revolution.

In an article which appeared in the *Spectator* of Saturday last, the process is alluded to thus:—"We have good news for the pre-Raffaelites. There is some chance of their being able to establish an illustrated organ, a daily paper if they please, which shall popularise their views by reproducing whatever sketches they may contribute to it, not only with perfect accuracy, but with greater ease in *proportion* to the minute finish and detail of the drawing. It has long been a complaint against wood engraving that an artist could never be sure that he would not find the most telling strokes of his pencil simply omitted in the print; moreover, our artists have been constantly hampered by the necessity for simplifying their drawings in order to facilitate the process of engraving." The article then goes on to describe the process, with some inaccuracies, but in suggesting, as before quoted, a daily illustrated paper, it does not at all overstep the bounds either of possibility or probability, the proprietors of the patent being perfectly prepared to meet any capitalist on the question.

It also presents a new field for the employment of female labour, which has engaged so much attention of late. Much of the drawing for which the process will create a demand is peculiarly adapted to the delicate handling of women; and I expect great good would result were the Department of Art to direct the attention of their students to it, and have it taught in their schools. It is also in contemplation to employ women in all the departments of the process in which hard manual labour is not required.

To the wood engraver—whom it might most reason-

ably be expected to injure—I believe it will eventually be a boon rather than otherwise. Engravers of any ability are well fitted by their previous training to do with little trouble much of the drawing required, and those whose ability will not admit of the change, would be far better off at other employments than earning the wretched pittance they now do.

It has been objected to this process that in stereotyping much of the fine work would be lost by the well known shrinkage of the metal in cooling, and that in consequence stereotyping has been altogether abandoned for electrotyping as far as regards wood blocks. This however has been found to be a complete fallacy, and I think the specimens here exhibited will amply prove it.

The results which have been supposed to be due to shrinkage, are due instead to the indifferent manner in which stereotyping is generally performed in this country, for I can say without hesitation that no English stereotypes I have seen, at all compare with those from New York, notwithstanding that the metal from which the

Fig. 4.

latter are cast is imported from this country. There is also another reason why stereotyping from wood blocks has been given up as not satisfactory. The wood is porous, and therefore a perfectly clean mould is with difficulty obtained in plaster. The Graphotype plates, on the other hand, have a solid and beautifully polished surface, and consequently present no such difficulty. The same workman will turn out a perfect cast of a block, without appreciable shrinkage—for the shrinkage after all only amounts to one-eighth of an inch in a foot—whilst the next cast he makes from the same block will be half filled up by carelessness in the manipulation of the mould.

To electrotyping there is really greater objection. electrotypes are very seldom, if ever, flat, and the graphotype plates are always a dead level. Stereotyping can be done in an hour and a-half, whereas electrotyping takes at the least twenty-four hours. In either case, however, a good workman with proper care can turn out a perfect fac-simile, and electrotypes, having the preference where large numbers are required, can as easily be obtained from the stereotype as from the wood. Objections of this kind are really only the workman's excuse for turning out bad work.

In tendering this subject for notice and discussion by the Society, my object will have been attained if I have succeeded in showing that an acknowledged want is now supplied by this process, which brings the artist's mind nearer to us, and at the same time cheapens the reproduction of his work, thus placing real art more within the reach of the masses.

DISCUSSION.

The Chairman having briefly described the mechanical process of stereotyping as practised in the present day, remarked that there was one feature about the process now introduced to them which he had no doubt would be found extremely valuable. Many present had no doubt noticed the great difference between old and modern wood engravings. In the works of Albert Durer and the wood engravers of that period, the lines were very dark and strong, and these artists did not attempt the graduated shadows which were found in modern wood cuts. By this process the effect of the old wood cuts was easily obtained, and he had no doubt that Durer, Holbein, and the artists of their time would have received it with infinite satisfaction. He thought there was one little drawback to it, which he was afraid would always exist, that was the absence of that mellowness of tone which a wood block gave, as compared with the hungry, dry look which attended the use of stereotype plates. As to the difference between the electrotype and the stereotype, he preferred the former as giving a better impression; but, with regard to this process generally, they must take the good with the bad. Its great facility, great cheapness, and the fact of its giving an exact reproduction of the artist's own work, were strong points in its favour, and they must put up with any small drawbacks such as that he had just referred to. They were told at the beginning of the paper that this invention came about by accident, in the use of an ordinary enamelled visiting card. They were afterwards told that, after two months of experiment with inks of all kinds, it turned out that glue and lampblack were the proper ingredients for the purpose. It seemed that for this simple thing a patent had been taken out. That circumstance struck him forcibly, and he now confessed himself a convert, or perhaps a "pervert," on the subject of patents. Here was a purely accidental discovery that lampblack and glue were the proper operating media, and yet the world was not privileged to use this process without the payment of a royalty to the lucky person who hit upon the invention.

Mr. Gilks said if he understood this invention aright it amounted to this—That a picture was drawn by the artist on chalk, and in the course of a short time, by a process of induration, the drawing made upon the chalk surface became converted into a marble picture in relief, and while in that state it was a very perfect production. It appeared, however, that it could not be printed from direct, but it was necessary to resort to the secondary process of stereotyping. It had to go through a "middle passage"—a sort of "purgatory," but unfortunately unattended by the purifying effects implied by that term. He had been informed by Mr. Fitz-Cook that it was impossible to print from the original chalk or marble drawing, as it would instantly smash under the pressure, and that stereotyping was therefore resorted to, another alleged advantage of which was that if any lines of the drawing were afterwards required to be removed this could be done. The secondary process of stereotyping and using the graver appeared therefore to be necessary in order to work out the ideas of the artist, and he (Mr. Gilks) confessed he had great doubts with regard to all secondary processes on account of their uncertainty, and the process of stereotyping was especially uncertain. With all deference to what had been stated in the paper on the subject of stereotyping, he asserted without fear of contradiction that it was thoroughly exploded for fine works of art on account of the effects which were produced by shrinkage on the fine lines of a picture, but for outline work there could be no doubt of its applicability. He should be glad to hear from Mr. Fitz-Cook whether, as the result of his experience of this process, artists' works had been really and truly reproduced, because he (Mr. Gilks) did not think the specimens round the room afforded sufficient evidence on that point.

Mr. George Cruikshank remarked that he was not at present sufficiently acquainted with this process to be in a position to give a decided opinion upon it, but from what he had heard of it he had no doubt success would ultimately attend it. Very similar results had been produced by a friend of his by a process of drawing or etching upon glass, and it remained to be seen whether the camel-hair pencil or etching point was the better for the purpose. Artists unaccustomed to it would find a difficulty at first in inverting the picture—as, for instance, putting a sword into the left hand, and firing a gun from the left shoulder in the original drawing. The result of his own experience led him to speak in the highest terms of wood engravers generally. He had seen his own drawings almost absolutely reproduced; but such work as that was expensive, and a great many failures might, perhaps, be fairly attributed to the price at which it was necessary the work should be done. He could compliment the wood engravers of the present day in the highest terms, and he sometimes picked up a woodcut in the streets which he took home and preserved as a real work of art. It could not be denied that wood engraving had arrived at a great pitch of perfection, and he did not think it would ever be entirely superseded by this or any similar process; for there were effects in wood engraving which could not be otherwise produced. However, had such a process as this been in existence when he was a boy, instead of riding, as he did, in an omnibus, he would have been seen in a "coach-and-six." He had been much gratified by what he had heard this evening, and he repeated he believed success would attend this process to a certain extent. Wood engraving would never, as he had before observed, be entirely superseded by this or any similar process, because a certain amount of mechanical work would always be required; but even if it should ever take away the occupation of the wood engraver, it would open another field of employment for the same class of artists as draughtsmen, for which it was to be presumed they had for the most part the necessary ability. He hailed this invention as another addition to art in facilitating the immense amount of illustration which was at the present time so great a vehicle of popular education and amusement.

Mr. George Wallis observed that the first question in regard to every new invention was—"Is the principle correct?" and the next—"Can the details which must follow upon that principle be carried out to a practical result?" He apprehended from what he had heard this evening, that both those questions must be answered in the affirmative. The facility of reproduction being thus established, the whole question resolved itself into one of tint drawing, and there was no doubt that, by practice, an artist could soon adapt himself to such a process as this, so as to be able to draw tints that would print, either from the marble block or from a good stereotype taken from it; for when they recollected the skill of wood-engravers in tint engraving, it was not too much to say that artists might arrive at the same perfection in tint drawing after they had had some experience in it. A process of this kind, which brought the public and the artist nearer together, was a great boon, and those who brought it forward deserved thanks. But there must be good drawing, there must be no reliance upon the secondary process of the engraver; the artist himself must produce his own effects, and this process would place the results of his mind and skill directly before the public. He had no doubt Mr. Fitz-Cook had met such people as he (Mr. Wallis) had come in contact with in reference to his own process of autotypography. On one occasion a friend remarked to him, "Then you have to make a drawing after all!" and he had to confess that it was an important condition of the process that the drawing should be made before it could be reproduced. In the process before them a drawing must certainly be made, but, as far as his experience went, he felt convinced that it had within it all the elements of success.

Dr. Bachhoffner hailed this invention as a great boon, which would place in the artist's hands a process which might lead to very important results. Whether it would eventually supersede wood engravings was a question; but in any case it opened up another field for art. There was one observation which fell from the chairman which greatly surprised him. The chairman told them he was a convert, or more properly a "pervert," on the subject of the patent law. He (Dr. Bachhoffner) feared it was a perversion from a good cause to a bad one, inasmuch as if he understood him aright the chairman declared himself to be an opponent of the patent law, and he had remarked that he could not see the application of a patent to lamp-black and glue. He (Dr. Bachhoffner) granted that there could be no patent in respect to the manufacture of those articles, but it was a totally different thing when they came to the application of them to an entirely new process—an original idea which might fairly claim the protection of a patent.

Mr. J. Beavington Atkinson said that if this invention could do all that it professed, it was to the arts of inestimable value. He need not point out the subtle relation which existed between the artist's hand and his mind—the value of even a single touch in a picture, and how readily it might be lost in translation by the engraver. Whether a mere mechanical mode of reproduction could actually preserve those delicate touches, the force of which the artist himself was often almost unconscious of, was a matter of considerable doubt; but it was well worth a fair trial. He should be glad to know whether there was at present any means of transferring photographs to the chalk surface. There were various means, more or less satisfactory—some extremely unsatisfactory—of reproducing photographs, and if this process was applicable to that purpose it would be of the greatest value. The drawings of Raffaelle and Michael Angelo at Oxford were some years ago sent to the Department of Science and Art at South Kensington, to be reproduced by photography. He had anxiously looked for the result, which had hitherto not appeared, although, within the last four months, these drawings had been engraved and published in the ordinary way. If this process was capable of application in the reproduction of the drawings of the old masters, through the medium of photography, a very great boon would be conferred upon amateurs and collectors of such works. It seemed to him, after all, the question was very much one of economy and speed; and if the patentees of this process could produce a really good article at a cheaper rate than formerly, the invention could not fail to be a valuable one.

Mr. George Cruikshank expressed his opinion that the artist who had been accustomed to one kind of drawing, whether in oil or water colour, would never leave it to take up this new process. Owing to etching having gone very much out of fashion, he had long ceased to practice that mode of drawing, and he believed that artists would never resort to anything like mechanical processes while they possessed the power to execute in oil or water colours. There must always be large pictures to be done by the engraver, in which a peculiar talent was exercised, which the artist either did not possess or had not taken the pains to cultivate. He had been repeatedly requested to etch his large picture of the Worship of Bacchus, but, looking to the amount of labour involved, he had declined the task. One matter of importance in connection with this process was the element of price, on which he should be glad to have information.

Mr. Fitz-Cook replied that the cost by this process would be only from one-half to one-fourth that of wood-engraving.

Mr. Noel Humphreys said it was to be borne in mind in reference to this process, that the effect of the picture was produced by distinct and definite lines, which must all be put in by the artist himself; whereas in wood-engraving the effects were to a great extent translated by the engraver. In the process now laid before them the artist must do all for himself, as the brushing operation was effected by purely mechanical means. Besides this it was necessary to employ a camel hair brush in drawing on the chalk in the place of the ordinary pencil, and in order to draw fine lines with such a tool great steadiness of hand and delicacy of touch were essential, which he apprehended could only be attained by long practice. Lithography, however, which gave the precise lines of the artist, had been brought to great perfection where the brush was used. In chromo-lithography it was at first found, where chalk was used for drawing, that the material on which the colours were placed became so charged with the colouring ingredients, that it filled up, and the shading became a mass of blur. Subsequently the drawing was done with a brush in lines, as in wood engraving. He did not say that by proper training and practice good artists could not acquire the power of using the camel-hair brush so as to realise all that could be hoped for; but in the meantime he thought this process was only applicable to the bolder class of drawing, such as the wood-cuts of Albert Durer and other early engravers. His own opinion was that if anything should arise to drive wood engraving out of the market, the fine wood-cuts of the present day would be sought for in after times as being amongst the most exquisite works of art of the age.

Mr. B. Waterhouse Hawkins said he had hoped that the challenge thrown out to the wood-engravers would have provoked them to an explanation of some of the advantages which the wood-engraver still possessed, and as he believed, for a long period of time would continue to possess, over the various processes which had been introduced, trenching as they did more or less upon that branch of art. In this process the production of fine lines was very difficult upon a material such as chalk, and if they were produced in the first instance he could not but fear they might afterwards suffer injury from the mechanical process of stereotyping. He was therefore surprised that the wood-engravers had not spoken of the advantages they possess in the

power of lowering and modulating the surfaces of an engraving, which was lost sight of in the process now described. It was not merely the fineness of the lines or their combination which produced the gradations of tint which characterised the higher class of wood illustrations in the present day. Those gradations of tint could not be dispensed with in order to produce a good picture, and, as far as he knew, they could only be produced under the hands of the engraver, by lowering his surface, so as to have less pressure on those portions which he desired should be light, and giving a full pressure, by contrast, to the darker portions of the picture. For mere forms without tint the process would be inestimable and perfect in its way, but there appeared little prospect at present that it would supersede the beautiful productions of wood engraving which it had taken so many years to bring to its present perfection.

Mr. D. Roberton Blaine said, though not an artist himself, the first thought which occurred to him on entering the room was how any artist, devoting himself to the production of such designs as were now on the walls, would be protected. If the design were an original one, it was clear the labours of the Society of Arts would be most valuable in this respect, in having prepared the Act of 1862. Then again it occurred to him, supposing the design not to be original—how then? It would then come in as a new process of engraving, and so be protected. He entirely agreed with what fell from Dr. Bachhoffner with regard to the patent laws, and he thought it would be a deplorable thing if they were so altered as to do away with that fair and just protection which was now accorded to inventors. He considered every man had a fair claim to be protected in the benefits of his invention.

Mr. Bishop called attention to similar processes of engraving which had come under his notice in the course of his travels. He had himself tried many materials for the reproduction of drawings, but had found nothing so good as lithographic stone, with which, however, the difficulty was to clear away the parts which were not required to be left in relief. The difficulty in all these processes was, as far as his experience went, in getting a perfectly clean line; and he agreed with the remarks of Mr. Hawkins with respect to the effects produced by gradations of the surface of the plate.

Mr. Fitz-Cook, in reply upon the discussion, said he could not do better than refer to the drawing by Mr. Holman Hunt exhibited in the room, which he believed was in itself a sufficient answer to the objection that had been raised as to the necessity for stereotyping. On the background and the face of the female figure there was no graver work whatever, and only a very little on the dress, where one or two shadings required to be removed, and, if such a result could be produced by stereotyping, the process could not be a bad one. With respect to the lowering of the surface in wood engravings, spoken of by Mr. Hawkins, he believed that was almost entirely given up, inasmuch as the same effect was produced by "overlaying" and "backing-up" in the printing. There would, however, always be specialities peculiar to wood engraving which this process did not, in all respects, pretend to supersede. With respect to the remarks of Mr. Noel Humphreys, he appeared to apprehend a difficulty in drawing lines on a chalk surface with a brush; but that was only because he had not tried it; for it was as easy to draw on chalk as on paper when the proper ink was employed. In lithography the drawing was more difficult, because the ink stuck on the stone, and there was danger of making the line too thick, or of producing no mark at all. Mr. Humphreys had also expressed a doubt as to whether this process was applicable to printing in colours, but in this it presented no more difficulty than wood engraving; indeed, in many respects, the facilities were greater; for a greater variety of texture in the drawing could be produced.

The Chairman, in proposing a vote of thanks to Mr. Fitz-Cook for introducing this subject to the Society, would notice very briefly two or three points that had been raised. It had been rather complained against this process that the artist was obliged to reverse his drawing. He had to do precisely the same in drawing on wood, and certainly there had been no complaint against wood engraving, as he understood, on this ground. There was, however, no doubt it had special qualities of its own which this process was not likely to rival, inasmuch as there was an absence of the mellowness which characterised high class wood engraving. It was complained that the artist must make his own lines; he must do that in everything; whether on wood or stone the artist must himself do the work. With regard to the use of the camel-hair brush, he might state that a good deal of lithography of the finest description was done by that tool, and, if he was correctly informed, neither Mr. Holman Hunt, Mr. Wallis, nor any of the other artists who had tried the experiment, had found any difficulty or inconvenience in making their drawings on the chalk surface used in this process.

The vote of thanks having been passed,

Mr. Fitz-Cook acknowledged the compliment paid to him.

The Chairman said—Before concluding the business, I feel it right to make an announcement to the members, which I am sure will cause them sorrow. It is the sudden death of a fellow member, well-known to, and appreciated by, many of his colleagues, and greatly distinguished beyond these walls. On Monday last Captain Fowke, R.E., died suddenly, at the South Kensington Museum, of the bursting of a blood vessel. He had been in declining health for some few months, but did not appear to be threatened with any immediate danger. As a man of science, possessing a fertility of invention which amounted to genius, he held the highest rank amongst his brother officers of the Royal Engineers. In the year 1854, before any of the experiments were made in gunnery now so much heard of, he showed me several projects for rifling cannon and firing elongated shot and shell. In the Paris Exhibition of 1855, where he was secretary of the English Commission, he exhibited a canvas pontoon, the like of which was successfully used during the late American civil war, although it has hitherto failed to impress itself upon our own military authorities. At that same exhibition he conducted a series of valuable experiments on the strength of colonial woods, which, in the colony of Jamaica, had the effect of increasing the annual exports of lance-wood spars fourfold, and raising mahoganies from 4,869 feet to 39,474 feet. After the Paris Exhibition he became the engineer of the South Kensington Museum. Popular ignorance tauntingly has often attributed to him the design of the iron building known as the "Boilers," which was the work of the late Sir William Cubitt—and a clever useful work too—who simply designed it as a means of affording temporarily the greatest amount of covered space at the cheapest rate. Capt. Fowke was called upon to design the little picture gallery for exhibiting Mr. Sheepshanks' noble gift of pictures, and for the first time, in concert with Mr. Redgrave, R.A., he, as an architect, demonstrated an accurate formula upon which a picture gallery must be built in order to exhibit pictures without glitter or reflection. He applied a novel principle to the lighting of picture galleries by gas; and, by the use of ingenious machinery, many thousand gas burners are lighted every evening in a few minutes. The Vernon and Turner galleries of the South Kensington Museum were built by him, with fire-proof floors, in the course of eight weeks, in December, 1858, at a cost not exceeding 3½d. a cubic foot, which is rather an unusually cheap rate for a public building. Captain Fowke had an almost unrivalled facility of economising the use of materials in his buildings. His greatest feat in this direction was the construction of a drill-shed for the use of the 1st

Middlesex Engineer Volunteers, of which corps he was the founder. He constructed this shed with semi-circular ribs covered with felt; it measured 100 feet long by 40 feet wide, was upon brick foundations, and the cost did not exceed £100. Showing it to Sir Joseph Paxton once, he guessed the price at three times the cost, and told me that it was the neatest thing in cheap construction he had ever seen. Numerous volunteer corps throughout the country have constructed similar sheds. Captain Fowke has employed a similar principle of construction in the several entrances to the Horticultural Gardens, where they may be seen. He gave the general plan for these gardens, which was subsequently modified in the gardening details by Mr. Nesfield. The design for the conservatory—which I venture to say is the prettiest in existence—as well as the design of the south arcades of the Horticultural Gardens, were made by Capt. Fowke. In the latter, he revived the use of terra cotta, which for more than half-a-century had slumbered in this country. Subsequently, with the aid of Mr. Godfrey Sykes as decorative artist—also a man of great genius—he has introduced it extensively, and with much effect, in the new buildings of the South Kensington Museum. Fortunately for the public service, he had completed, before his death, the greater part of the design for the South Kensington Museum, and it will be quite possible, from the materials which he has left, to carry out his intentions; but the Lord President (Earl Granville) is fully sensible that the department has sustained a very great loss by his death. As architect of the Science and Art Department, he designed the New Industrial Museum in Edinburgh—a very successful building,—and also the interior of the National Gallery in Dublin, in both instances having to design under stringently economical conditions. On a former occasion I explained in this room* the reasons for which he had been chosen as architect of the International Exhibition of 1862. In this case the problem was not to erect a gay building, to last a few months only, but to fill a very large space in such a way, and at a limited cost, that it might hereafter be made permanent. It is obvious he had no funds for decoration. Although, for the purposes of exhibition, the exhibitors pronounced the structure as the most successful for the purpose which had hitherto been made, in respect of lighting, ventilation, and general convenience, the public did not believe that it could be made properly decorative, and the House of Commons declined to purchase it at the cost of the old materials. Looking back dispassionately on the past, I have learnt to think that this was a wise decision, but during the controversy, which bore very hard upon the architect, it was impossible that any man could show higher qualities of patience, resignation, and gentlemanly bearing than did Captain Fowke, and at last the public made amends to him for its injustice. In an open competition to the world, in which some of the most eminent architects competed, the five judges, of whom three had taken an active personal part in causing the pulling down of the exhibition building, unanimously awarded to his design the first prize, and the architectural press and public fully confirmed the decision. We may hope to see this magnificent design properly realised. Moreover, in the forthcoming Paris Exhibition, the exact proportions and size of the picture galleries of the Exhibition of 1862 have been avowedly adopted as incapable of improvement. I firmly believe that the arts of construction in this country have sustained a great loss by Captain Fowke's death. At this period, when Art is so transitional, and Science is making so many discoveries, and men's minds are seething with inventions; when the use of new materials is being constantly manifested, and the new adaptation of old materials is constantly entered upon, England has lost a man who felt the spirit of his age, and was daring enough to venture beyond the beaten path of conventionalism. Captain Fowke, to my mind, was solving the problem of the decorative use of iron, and, by appreciating the spirit both of the Gothic and Renaissance architects, was on the threshold of introducing a novel style of architecture, when—alas!—Death, at the early age of forty-two years, has cut short his promising career.

* Vol. X., p. 55.

Proceedings of Institutions.

Liverpool Institute.—Mr. Astrup Cariss, the Secretary of the Liverpool Institute, has resigned this office, which he has filled with ability and credit for a period of more than eleven years. The Board of Directors, on receiving his resignation at their last monthly meeting, passed a resolution expressing their regret, and their sense of the zeal, energy and efficiency with which he had discharged his duties.

Macclesfield Useful Knowledge Society.—The annual general meeting was held on the 8th of November, Mr. E. C. Egerton, M.P., in the chair. Mr. Nicholson, the secretary, read the report, from which it appears that the society possesses more members than it did last year. The list is as follows:—Honorary, 171; ordinary, 218; friends and junior members of classes, 115; making a total of 504. The decrease in the number of the honorary members is accounted for by 19 withdrawals, 11 removals from town, and 9 deaths; 13 new honorary members have been added. Thus the increase in the total number is obtained by additions to the ranks of the ordinary members and to the classes. The classes are now constituted as follows, the numbers giving the average attendance:—Arithmetic and geometry, 34; reading and writing, 33; grammar, 13; history and geography, 25; French, 11; phonography, 11; general instruction (female), 27; sewing (ditto), 18; general instruction (junior), 44. The students have submitted during the past year to the following examinations:—1st. The Elementary of the Lancashire and Cheshire Union of Institutes; 2nd. The Final of the Society of Arts; 3rd. The Government Department of Science and Art; and, 4th, the local one. In the Union examination ten certificates were awarded. The results of the Society of Arts' examination have already appeared. The local examinations were most successful, and the examiners' reports were generally favourable. The science classes have recently commenced their session; they have been opened free to members of the society, and at a very low charge to non-members. The subjects selected for this session are "Sound, Light, and Heat," and "Inorganic Chemistry." Geometry is a subject but lately added to the class list. The French class is now open to members who are of the artizan class without any extra fee. A field naturalists' class has also been established, and doubtless will prove, during the coming year, a great source of attraction from the numerous interesting fields open to its investigation. The committee congratulate the society upon the great prosperity and usefulness of the classes; the class-rooms are often inconveniently full, and many more might be accepted as members if accommodation could be provided. It is believed that there never was a period when the society's educational operations were more usefully adapted or more satisfactorily conducted than at the present. In consequence of the Electric Telegraph Company advancing their charge from £40 to £60 per annum, it was decided, at a general meeting of members held last December, to discontinue the receipt of telegrams. The circulation of works from the society's library has been 9,800, and from Mudie's library (to which the society has subscribed in the absence of the telegrams), 1,388—a total of 11,188. From the limited funds at the disposal of the committee, they have not felt justified in making a greater addition to the library than some 50 volumes. The total number of volumes in the library now is about 5,000. The committee thank various members for dona-

tions, and record a severe loss to the society in the deaths of two of its vice-presidents—Messrs. Thomas Brodrick and William Potts. The financial statement for the year gives the following results:—Receipts, £473 0s. 10d.; expenditure, £556 15s. 9d.; balance due to treasurer, £83 14s. 11d. The School of Design report states that the number taught drawing has been for the year 841—97 in the Central School—divided thus: 22 ladies, six pupil teachers, four free and 65 general students, and 744 in the schools of the town. Nearly 500 presented themselves for examination in freehand drawing, geometry, perspective, model drawing, &c., and 402 were successful—gaining boxes of colours, boxes of instruments, drawing boards, T squares, certificates and cards. The students of the Central School have also obtained nine medals, and one national medallion or Queen's prize.

BRITISH ASSOCIATION, 1865.

On the Effect of Blowing Blast Furnaces with Blast of very High Temperature.

In Section G, Mr. E. A. Cowper read a paper, of which the following is the abstract:—

The author said he would not detain the meeting with a history of the numerous attempts which have been made to raise the blast of blast furnaces to a very high temperature, nor would he occupy much time in the description of the means by which the desired result has been obtained, as a full account of the apparatus was given at the meeting of the Association held at Oxford (though the paper on the subject was not printed in the Transactions). In 1861, experimental stoves only on the new plan had been erected, and worked for heating the blast for one tuyere, out of the fire used for one blast furnace. Such satisfactory results were, however, obtained, that it was clear that the difficulty of procuring blast of very high temperature had been overcome; and Messrs. Cochrane and Co., of Woodside Ironworks, Dudley, and Ormesley Ironworks, near Middlesbro'-on-Tees, forthwith erected large stoves on the new plan for a complete blast furnace; and it is now proposed, with your permission, to lay before the section the results obtained during upwards of four years' practical working with these stoves.

The effect of heating air on the new plan was that a temperature of blast of 1,150 deg. Fahr. was obtained, instead of only 600 or 700 deg. as with cast-iron pipes in the common stoves. There was no loss of blast from leakage, owing to cracked or damaged cast-iron pipes; the iron produced was of rather better quality; 20 per cent. more iron was made from the same furnace; and fully 5 cwt. of coke was saved in the blast furnace per ton of iron made.

The details of the construction of the new stoves were shown by drawings. First, there are two stoves, which are heated alternately, and used alternately in heating the cold air; these are filled with brickwork, "set open" (or small spaces between the bricks), and form "regenerators," on the principle of Mr. Siemens's regenerator furnaces, as now so largely and successfully used in glass houses, gas works, iron works, &c., both for obtaining great heat and economising fuel. The outsides of the stoves are of thin wrought-iron plate, lined with fire-brick, the iron skin being necessary to retain the blast under pressure, whilst the fire brick resists the heat. Second, there are provided for the purpose of heating the stoves, valves for the admission of gas and of air into a central flue, where combustion takes place when a stove is being heated, the products of combustion passing up the flue and down through the mass of fire-bricks forming the regenerator, and escaping at the bottom to the chimney, after the whole of the heat has been abstracted by the fire-bricks, the temperature of the chimney being from 212° to 250°, or thereabouts, during the time a stove is being heated, viz., for a period of four hours. Then when a stove is hot, the gas and air are turned off, the chimney-valve shut, and the cold blast is turned on at the bottom of the regenerator, and passes up through the bottom courses of brickwork in the regenerator, thus very quickly becoming heated, and passing in this heated state up through the remaining courses of hot brickwork, and down the central flue through the hot-blast valve to the blast furnace, the process of absorption of heat by the air being so perfect that as long as a few of the top courses of brickwork remain hot, the blast is well heated, the variations in the temperature of the blast being only about 100 degrees Fahrenheit, with four hours' changes. Thirdly, the gas for heating the stoves was supplied from gas producers, similar to those commonly used by Mr. Siemens for his regenerator furnaces, and which have already been described before this Association. They consist of a simple brick enclosure or fireplace, with bars near the bottom, for the admission of a very small quantity of air. The gas is formed by the slow combustion of a very thick fire, supplied with poor coal or slack down a slope or hopper, the gas passing off from above the fuel through pipes to the hot blast stoves. Gas may, however, be taken from the top of the blast furnace for heating the stoves, provided proper arrangements are made to separate it from the dust which comes over from the blast furnace with it; and, judging from recent practical experiments, it is certain that there are several ways in which this may be done with perfect success.

The late Mr. James Beaumont Neilson, who did so very much for the iron manufacture by his original invention of the hot blast in 1822, was sufficiently long-sighted to predict the advantages that would flow from the use of blast of very high temperature, though, as it happened, he was limited to what could be obtained from passing the air through iron pipes exposed to a fire, as in common stoves. Mr. Neilson said: "In the new regenerator ovens that had just been described, the great capacity of fire-brick for heat had been well taken advantage of, and a very important step in advance had been made by giving the means of raising the temperature of blast much above the extreme limit practicable with the old ovens; and he considered this would be productive of the greatest benefit in the working of the blast furnace—he had no doubt the 'make' of iron would be considerably increased by the higher temperature of blast given by the regenerative ovens." These anticipations have been fully borne out in practice during upwards of four years' regular working of the stoves. The high temperature of the blast produces such an improved effect in the furnace, that the "burden" is increased so as to save fully 5 cwt. of coke per ton of iron made; and as there is less fuel supplied, so there are less impurities taken in, and the quality of the iron is improved, the tuyere breasts do not work hot or burn, or give more trouble than usual, as the burden is increased as just stated. The same furnace is of course enabled to do more work, the "make" being increased fully one-fifth, so that a given plant produces 20 per cent. more iron per annum, besides saving nearly three shillings per ton for coke. There is less friction or loss of pressure of blast in these stoves than in common ones; and there is no loss of blast by leakage through cracked or burnt cast-iron pipes or joints. More stoves are now being erected on the same plan."

Mr. Siemens said that the application of regenerators which Mr. Cowper had brought before the meeting was one of the most interesting which could have been made. He had provided the means of heating blast nearly up to the temperature at which bricks would melt. Mr. Siemens defined the chemical process effected by Mr. Cowper's arrangement, and affirmed that there was no deterioration of the quality of the iron produced by that process.

Fine Arts.

Paris Exhibition of Fine Arts, 1866.—An impression has got abroad that, with a view to the Universal Exhibition to be held in 1867, there would not be

an exhibition of the works of living artists in Paris next year; this report, however, was officially contradicted, and the regulations for the *salon* of 1866 have now been published. Th Exhibition is to open as usual on the 1st of May, and to close on the 20th of June. The number of medals to be given is forty-nine in the section of painting and drawing, fifteen in that of sculpture and medal engraving, six in that of architecture, and eight in that of engraving and lithography. An important alteration has been made, however, with respect to the two great extra prizes—medals of honour, of the value of 4,000 francs each, awarded for the best picture and the best sculptural work, when the judges are of opinion that any in the exhibition merit this special honour. Medals of honour were awarded this year to M. Cabanel, for his portrait of the Emperor, and to M. Paul Dubois for his statue of a young Florentine of the fifteenth century, singing and accompanying himself on the lute. On former occasions these, as well as the ordinary medals, have been awarded by the jury previous to the opening of the exhibition, and, of course, in the case of such a marked honour, a considerable amount of discussion, not to say jealousy, is called forth; a change is now to be made, both as regards the composition of the jury and the period of the awards. It is the practice at these exhibitions to close the *salon* for a few days about the middle of the term, and to re-arrange the pictures and other works of art, in order to afford an opportunity for revising the whole, and bringing meritorious productions into better or different positions. This practice will be continued, and the medals of honour will not be awarded, nor the ordinary medals announced, until after such revision; moreover, the former will not be determined by the jury, but by a vote of the whole of the exhibiting artists who have received honours at former exhibitions, that is to say, one of the new medals, of the value of 400 francs, one of the first-class medals under the former regime, or the Cross of the Legion of Honour. By this arrangement the medals of honour will be conferred by the *élite* of the artists themselves, and after public opinion has had full opportunity of expression. The Jury of Admission, and which awards the ordinary medals, is now elected by the body of artists, so that the whole of the honours are in reality distributed by the suffrages of the artistic community, though not directly, as will be the case next year with the grand medals of honour. It seems impossible to carry the principle of reform further than this, every artist who has himself achieved the reward of merit having a voice in the distribution of the same among his fellow-artists. One other judicious change has been made in the regulations—heretofore, every artist who had obtained a medal in any section of art was exempted from the action of the Jury of Admission; in future, such exemption, as well as the right of voting for the jury, will only apply to the special section in which the medal or decoration was obtained, so that painters, sculptors, engravers, and other artists will not interfere with the awards out of their own line. This limitation does not, however, appear to apply to the vote for the two great medals of honour. The number of artists who voted this year for the jury was only 202, a very small number out of so large a body, but the result was perfectly satisfactory as regards the jury elected.

Commerce.

Sugar.—The increase in the consumption of sugar is continuous. In 1864, from a variety of causes the quantity delivered in the first ten months was comparatively small, and the increase for the present year to the end of October amounted to no less than 13·5 per cent. In 1863 these exceptional causes did not operate, but, in consequence of this year's low prices, the increase for the ten months of 1865 over 1863 has been no less than nine per cent.

Coffee.—The Board of Trade Returns for the ten months ended 31st October, 1865, when compared with the corresponding period of last year, show that in imports there is an increase for the present year of 6,640 tons; in exports also an increase is shown of 7,510 tons; and for home consumption there is a decrease of 350 tons.

The Extension of Trade.—Much food for cautious reflection (say Messrs. Travers) is furnished by the Board of Trade Returns, just published. Our Exports during October were the largest ever known in that month, and exceeded those of October, 1864, by 20 per cent. At the same time, it appears there is now a prospect that the entire trade of the year 1865 will surpass that of any upon record. During the earlier months there was a considerable falling off as compared with last year; but latterly the totals have been enormous, and the result is, that the aggregate value of our shipments for the ten months, to the 31st of October, show an amount only ½ per cent. below those of the same period of 1864. Should the return for November and December keep pace with the recent ones, they will bring the figures for the year to a point never before attained. In any case, the important fact has even at present been reached, that the *profits* from our Exports have been beyond all precedent. The extraordinary totals were greatly swollen by the enhanced prices of the leading staples of which our manufactures are composed; but the totals now presented represent a much smaller value of raw material, and a much greater value paid for labour. Of several descriptions of goods we have shipped twice the quantity of last year, at an increase of cost of only about one-fourth. At the same time there has been undiminished employment for our shipping, the American marine not having yet, to any material extent, recovered from the displacement it experienced during the war. That all this prosperity has thus far been actual, as well as apparent, there is every reason to believe. To the question whether it will last, the answer cannot be so positive. That the trade of the coming year will rival or excel even that of 1865, at all events during its earlier months, is hardly to be doubted. Indeed, a great increase may be expected, and it is in that fact that danger lies. Such profits as have lately been gained were never yet realised without leading to inflation, and it will be against all experience if we are not now approaching a period of comparative recklessness. Both in the eastern and western hemispheres, as well as at home, symptoms of this are already apparent. The speculative ardour at Bombay was but temporarily checked by the revulsion in the spring and summer: and at New York the merchants seem to have no idea but that the population of the United States will be able to go on giving orders to any extent for foreign goods, the cost of which is doubled by the existing tariff, while the Southern States have a long period of trial and disorganisation to pass through, and those of the North are unable, as it now appears, to compete with the States of the Continent of Europe in the English grain market.

Colonies.

Queensland Population.—The population of Queensland on the 31st December, 1864, was estimated to have consisted of 45,516 males, 28,520 females, and the total number of persons to have been 74,036. The mean population of the year is calculated to have been 41,548 males, 26,290 females; total, 678,38 persons. The total increase in population which took place during the year 1864 was 12,396 persons, and the portion of this increase arising from the greater number of births than of deaths was 1,437 persons—572 males and 865 females.

Comparing these figures with the mean population of the year as given above the annual ratio of increase from natural causes alone is, of males, 1.38; of females, 3.29, and of persons, 2.12, which is exactly one per cent. higher than the average English rate.

CATTLE DISEASE IN NEW SOUTH WALES.—A colonial journal says that meat is at an unusually high price in this colony. Fat stock are scarce, and it has been difficult to get them to market in fair condition. The scarcity of cattle has been promoted by a visitation of the disease known as pleuro-pneumonia. This disease committed a good deal of devastation, and led to the destruction of many more cattle than would have died of it. Stockholders were alarmed, and rushed their beasts to the shambles while they were alive and still saleable—the breeding stock as well as the bullocks being consigned to the butcher. A great many cattle runs have been turned into sheep runs. This was partly because it was thought that sheep were paying the best, and partly because the system of free selection in land was more damaging to a cattle run than to a sheep run. For a time beef was low in price, now there is a reaction, and the price threatens to run high for some time to come.

COPPER MINES IN NEW SOUTH WALES.—At the present time a perfect *furore* for copper mining prevails in the Western districts, and rich veins of copper have been traced from the Canoblas mountain range, that divides the Lachlan watershed from that of the Macquarie, to Carcoor on the south, and to Ophir on the north, or over an extent of country fifty miles in length. The principal copper mine as yet at work is that of Cadiangalong, on the southern watershed of the Canoblas, and about sixteen miles from Orange. It employs when in full work two hundred and fifty hands. The smelting works at Cadiangalong are very complete, and work up about 200 tons of ore per month, returning on an average about 30 tons of pure copper. The Carangara copper-mine is about eighteen miles distant from Cadiangalong, in a northerly direction. The mines have been opened for some years, and smelting works were erected on them. But the mistake was made of putting up blast furnaces, and the company found they could not get a sufficient per centage of copper to pay. The ores are gossan ores to the ten-fathom level, when the sulphurets commence. In the Southern district a copper-mine has been opened at Curawong, twenty-two miles south from Goulburn, and about seven north of Collector. It is as yet only in its infancy, but a valuable vein of black ore has been struck at a depth of seven fathoms. There are also numerous veins of gossan ores traceable on the surface.

PETROLEUM SHALE IN NEW SOUTH WALES.—A Sydney paper says that companies have been formed there, and their operations are proceeding with the fullest confidence of success in the development of a source of wealth which has been hitherto unknown. The shale coal, ascertained to exist in abundance throughout certain parts of the colony, particularly in the district of Harley, and the bituminous qualities of which have been well tested, is one of the resources of the country which yet remain to be fully examined. At present the discovery is scarcely known beyond the limits of those who are engaged in its development.

Publications Issued.

JOURNAL OF SOCIAL SCIENCE. No. 1. Edited by Edwin Lankester, M.D., F.R.S.—This journal, just started, has for its object the recording the proceedings of the Annual National Association for the Promotion of Social Science, as well as circulating the papers read at its London meetings, and of supplying original papers and information generally on the subjects embraced by the Association. The present number contains the proceedings of the Sheffield meeting of the Association, papers "On the Outbreak of Cholera in Egypt," by Dr. Tilbury Fox; "On the Cattle Plague," by Professor Gamgee; "On the Protective Duties of America," by J. Noble; and "On the Examination of Girls." There is a review of local sanitary legislation and a monthly chronicle of matters connected with the cattle plague—Cattle Plague Commission—Cholera at Thornton Bois, near Epping—Mortality of Children in Manufacturing Districts—the Ladies Medical College—Thomas Carlyle on Education in Natural Knowledge. A summary of the proceedings of societies and correspondence completes the work.

Forthcoming Publications.

THE MIRROR OF SCIENCE (*office*, 147, *Fleet-street*) will shortly be published, size 16 quarto pages, illustrated, being a weekly miscellany of entertaining and instructive articles on photography, chemistry, electricity, &c. Price 2d. weekly.—The object of this publication is to provide a record of the progress of science all over the world, but in its pages room will be given to photograpy, electricity, chemistry. astronomy, the telescope, and the balloon; to discoveries relating to animal, vegetable, and insect life; to the microscope; land and ocean telegraphy, magnetism, and the collateral sciences and arts. It is intended by the editor to devote some of its columns to the use of subscribers for scientific notes and queries.

Notes.

POULTRY IN FRANCE.—An exhibition of fat poultry, as well as of cheese—the latter international—is announced to take place in Paris on the 18th to 21st of December in the present year; gold, silver, and bronze medals, together with a sum of 5,000 francs, for small premiums, are placed at the disposal of the juries. Poultry has always been a very important article of consumption in France, and it becomes more so every year; in 1788, the consumption of Paris was estimated by M. Tessier at 2,266 tons per annum, including game; in 1817 it had reached twice that amount; in 1825 it was nearly 6,000 tons; and in 1864 it amounted to about 13,000 tons. The following are the items of the return:—

	Heads.
Fowls	4,500,000
Rabbits	1,700,000
Pigeons	1,700,000
Geese	700,000
Ducks	700,000
Capons	400,000
Turkeys	400,000
Kids	50,000
Total	10,150,000
Larks	1,700,000
Partridges	625,000
Hares	200,000
Thrushes	80,000
Pheasants	40,000
Snipes, quails, and woodcocks	50,000
Venison	7,000
Wild ducks	45,000
Plovers, landrails, &c.	9,000
Various	120,000
Total	2,876,000

The average consumption for the population of Paris has

risen from less than eight pounds, in 1788, to about twenty pounds, in 1864, per head per annum. The total value of the poultry and game consumed in Paris is given, for 1840, at about £320,000; for 1845, at £400,000; for 1850, £480,000; for 1855, £680,000; for 1860, £880,000; and for 1864, £1,040,000; and, with slight exceptions, the progression has been uninterrupted, the increase since 1848 having been equal to £40,000 per annum. The whole of the poultry and game consumed in Paris passes through the market of La Vallée, on the South side of the Seine, and the municipality of Paris derives a very large income from octroi and other taxes; in twenty years these produced twenty-four millions of francs, and in the year 1860 nearly two millions. All poultry and game sent to the market pays 10 per cent. *ad valorem*, and that which is directed to individuals pays an octroi tax of 15 per cent. for geese, turkeys, tame rabbits, lamb and kid —which are classed with poultry—and of 30 per cent. for all other kinds. The trade is a close monopoly, there being but eight licensed factors, who receive one per cent. *ad valorem* on all the poultry and game sold in the market, whether by themselves or the proprietors; a factor's privilege is worth from £4,000 to £6,000, and yields an average income of £600. The following are the localities most famous for poultry:—Toulouse, Le Mans, Mortagne, and Strasbourg, for geese; the Oise, Somme, Pas de Calais, and the Nord for pigeons; the Loire-Inferieure, Sarthe, Seine-et-Oise, Indre-et-Loire, L'Eure, and Loiret for ducks; the Cher, Aube, Indre-et-Loire, Loiret, Seine-et-Marne for turkeys; Sarthe, Calvados, Oise, Somme, Seine-et-Marne, and Seine-et-Oise for fowls, and the first two especially for capons.

Graphite.—The *Russian Correspondence* announces that a stratum of graphite (blacklead for pencils) has recently been discovered near the sea of Azoff, equal in quality to that of Siberia.

To Correspondents.

Erratum.—In last number, page 47, column 2, line 4 from bottom, for "lighting" read, "tilting."

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Geographical, 8½. 1. Rev. W. Ellis, "On Ankova, the Central Province of Madagascar, and on the Royal or Sacred Cities." 2. Captain W. Rooke, R.A., "A Boat Journey Along the Coast Lakes of East Madagascar."

Tues. ...Civil Engineers, 8. Mr. John Grant, "Experiments on the Strength of Cement, chiefly in reference to the Portland Cement used in the Southern Main Drainage Works."
Zoological, 8½.
Photographic, 8.
Syro-Egyptian, 7½.
Ethnological, 8. Mr. John Crawfurd, "On the Oriental Negroes—namely, Andaman Islanders, Papuans, Feejeeans, &c."

Wed. ...Society of Arts, 8. Mr. J. C. Morton, "On London Milk."

Patents.

From Commissioners of Patents Journal, December 1st.

Grants of Provisional Protection.

Anchors—3004—S. Hunter.
Bilge water, discharging—3001—A. V. Newton.
Bottle fountain—2847—J. Nadal.
Bottles, machine for drawing corks from—2844—H. J. Sanders.
Bricks—2915—E. Guthrie.
Bricks or building blocks—2967—L. G. Speyser.
Capsules—2093—W. Betts.
Caramel—2950—A. V. Newton.
Cast iron, process for hardening—2964—W. E. Newton.
Cement—2863—T. Grayson and J. O'Donoghue.
Cigars or tobacco, apparatus for igniting—2868—H. Bateman.
Cisterns, liquid sealing to the covers of—2986—G. P. Hemming.
Coats, &c., draughting patterns for—2955—J. H. and G. R. Smith.
Coffee, roasting of—2951—A. V. Newton.
Cooking apparatus—2971—S. H. Huntly.
Cotton seed, taking the fibre from—2956—W. H. Cope.
Currants, &c., cleaning or dressing—2978—A. Rickett.
Dress, bows or ties for articles of—2975—I. Lazarus.
Feathers, bleaching—2987—W. Clark.
Fibrous substances, preparing, &c., of—2778—J. Combe.
Fibrous substances, spinning and doubling—2980—J. B. Edge & R. Hird.
Fire-arms, breech-loading—1894—W. L. Penotière.
Fire-arms, breech-loading—2958—J. R. Cooper.
Fresh water from salt and impure water, obtaining—2953—S. H. Huntly.
Friction matches and tapers—3002—S. A. Bell.
Furnaces—2682—W. Beardmore.
Furnaces—2963—T. M. Tennant.
Gas—2965—J. Harbert.
Guns, breech-loading—2981—C. Whitney.
Gymnastic exercises, apparatus for—2767—G. W. Bacon.
Hair-brushing apparatus—2994—G., G. and C. W. Smith.
Hydraulic presses—2698—T. Routledge, D. Bentley, and J. B. Jackson.
Hydro-carbon fluids, lanterns for burning—2809—E. A. Phillips.
Iron, &c., separating phosphorus from—2482—C. H. L. Wintzer.
Iron, sheet, cutting—2989—R. and T. E. M. Walters.
Iron washers, bevilled or convex—2957—G. Carter.
Knitting machine needles—2960—W. Clark.
Liquids, measuring the flow of—2968—W. Payton.
Locks—2991—F. Pope.
Metallic wheels, moulds for casting—2959—T. J. Perry.
Ordnance—2795—W. Deakin and J. B. Johnson.
Photographs, rests employed in taking—2949—O. Sarony.
Railway carriages—2394—J. H. Johnson.
Railways, safety apparatus for preventing accidents upon—2930—W. E. Newton.
Railway tickets, stamping—3005—A. Lancefield.
Railway train, communication between passengers, guard, and driver of a—3003—W. Birt.
Safe and other doors, fastenings for—2979—J. B. Fenby.
Sewing machinery for using waxed thread—2748—A. V. Newton.
Sewing machines—2784—W. and E. Westmoreland.
Sewing machines—2974—H. Clifton.
Sewing machines—2988—J. Pitt.
Shawls—2961—R. A. Brooman.
Soap—3007—J. J. Field.
Spinning machinery, pressure to rollers of—2995—T. R. Harding.
Spongy metals, production of—2106—J. H. Johnson.
Steam, condensing exhaust—2996—A. V. Newton.
Steam, &c., cocks for—2990—S. Bennett.
Steel—2870—F. Prange.
Tenons, cutting—2911—W. T. Hamilton.
Vessels, steering gear for—2865—W. Esplin and J. Clarke.
Volatile liquids or fluids, obtaining artificial light from—2998—W. Wells and S. Marland.
Weaving, power looms for—2947—M. Caton and H. Holden.
Windows, sash fastening for—2997—W. Parsons.
Wool, detergent solution used in cleansing—1932—J. H. Johnson.

Invention with Complete Specification Filed.

Fire-arms, breech-loading—3013—E. G. Lamson.

Patents Sealed.

1528. E. Eastman.
1530. W. Townend.
1533. C. de Bergue.
1534. T. Gentle and J. Allmark.
1535. P. Coombes.
1536. A. J. Aspinall.
1538. J. Robertson.
1539. J. H. Johnson.
1540. R. A. Brooman.
1547. D. Barker.
1550. R. A. Brooman.
1551. A. and A. W. Pemberton.
1555. V. Duterne.
1557. W. Tongue.
1563. S. B. Tucker.
1565. S. Stell, T. Broughton, and F. Hall.
1610. W. Edson.
1611. G. E. and J. Keats.
1618. V. Poitevin.
1621. W. Clark.
1656. W. Clark.
1658. J. Scholl.
1665. W. Clark.
1668. C. H. Gardner.
1680. R. Eastman.
1773. J. Braithwaite.
2152. J. Bowden.
2221. W. P. Gregg.
2245. O. Bennett.
2312. W. E. Newton.
2314. J. Casthélaz and N. Basset.
2349. S. Wales.

From Commissioners of Patents Journal, December 5th.

Patents Sealed.

1558. T. Smith.
1560. J. Ferguson and R. Miller.
1571. W. W. Hulse.
2153. G. G. Dennis.
2315. G. T. Bousfield.
2469. G. T. Bousfield.
2485. B. Wren.

Patents on which the Stamp Duty of £50 has been Paid.

3215. T. Waller.
3188. J. T. Caird.
3259. R. Hornsby.
3326. T. E. Vickers.
3310. S. B. Whitfield.
3214. G. F. Griffin.
3243. C. F. Claus.
3249. H. Swan.

Patent on which the Stamp Duty of £100 has been paid.

2964. R. Hornsby.
2734. J. Coulson.
2746. G. W. Bales.
2751. L. Bissell.
2757. W. Robertson and J. G. Orchar.
2837. C. Hodgson.

Journal of the Society of Arts.

FRIDAY, DECEMBER 15, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'clock:—

December 20.—"On Parkesine, its Composition, Manufacture, and Uses. By Owen Rowland, Esq.

Musical Education Committee.

This Committee has resumed its meetings for the present session. The first meeting took place on Tuesday last, at two o'clock. Present: —Lord Gerald Fitzgerald; Sir John Harington, Bart.; Colonel Scott, R.E.; Captain Donnelly, R.E.; E. A. Bowring, Esq., C.B.; and Henry Cole, Esq., C.B.

The Secretary was examined in reference to his visit to the Conservatoire de Musique at Brussels, and put in a written report, embodying the result of his visit. Mr. Henry Cole, C.B., was also examined.

The evidence will be printed in subsequent *Journals*.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Fifth Ordinary Meeting.

Wednesday, December 13th, 1865; James Caird, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Dalrymple, Robert Farre, 46, Parliament-street, S.W.
Edwards, Rev. Joseph, Vicarage, Barrow-upon-Trent, Derby.
Galpin, Thomas Dixon, La Belle Sauvage-yard, Ludgate-hill, E.C.
Garrod, J., 56, Upper Thames-street, E.C.
Gideon, Henry H., 8, London-street, Fenchurch-st., E.C.
Harton, Samuel, jun., 61 and 62, Shoe-lane, E.C.
Shaw, Matthew T., 64, Cannon-street, E.C.
Smith, William Baxter, 37, King-street, Cheapside, E.C.
Southey, Thomas, Clapham-park, S.
Tidswell, J., 28, Budge-row, E.C.
Walker, Robert, 58, London-wall, E.C.
Watson, Charles, M.D., 1, South-crescent, Bedford-square, W.C.
White, W. W., 5, Great Winchester-street, E.C.
Wieler, William Julius, 73, Mark-lane, E.C.
Williams, William, 41, Basinghall-street, E.C.
Wontner, Thomas, 26, Bucklersbury, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Bailey, Vincent, 26, Orsett-terrace, Hyde-park, W.
Bazalgette, Joseph W., Wimbledon, S.W.
Becker, Hermann, M.D., Park Browse House, Lizard, Cornwall.
Butler, Edward R., 9, Madina-villas, Hove, Brighton.
Dowson, Alfred C., Arts Club, 17, Hanover-square, W.
Finlaison, Alexander Glen, National Debt Office, 19, Old Jewry, E.C.
Gray, William, 5, Tokenhouse-yard, E.C., and 9, The Grove, Lee, Kent, S.E.
Lambe, Frederick, 4, Villas, Erith, S.E., and 2, Cushion-court, Old Broad-street, E.C.
Latham, Baldwin, C.E., Broad-green, Croydon, S.
Mare, Charles John, 21, Great St. Helen's, E.C.
Pullman, John, jun., 17, Greek-street, Soho, W.
Talrich, Jules Victor Jacques, 42, Rue du Col de Médecine, Paris.

The Paper read was—

ON LONDON MILK.

By J. Chalmers Morton, Esq.

It is the object of the following paper to relate whatever information on the production and consumption of milk in London could be collected in a very limited time by a single volunteer inquirer. The subject was suggested twelve months ago as proper for discussion before this Society, which occupies itself not only with strictly agricultural questions, but also with matters connected with the health and general welfare of the population; and it has since then excited unusual interest, owing to the diminished supply of milk which has latterly been occasioned by the cattle plague. It was not, however, until a fruitless attempt had been made to enlist another inquirer, who possessed better opportunities than mine of investigating this subject, that I resolved to devote whatever time could be commanded during October and November to its examination for the purpose of this paper.

No justification will be considered necessary of an attempt of this kind to throw all the light that can be brought to bear on an important branch of our food supply—neither has any such justification been required by the great majority of those to whom my inquiries have been addressed. From wholesale and retail dealers in milk—from wholesale and retail consumers of milk—from the railway companies who are carriers of milk—from the district medical officers of the metropolis, whose inspectors have the oversight of the cow-houses within their respective districts —from these inspectors, and from all the cow-keepers, without exception, to whom they have introduced me, I have had frank replies to all my questions; indeed it seemed in this way to be cordially admitted that the outside public, whose interest in the subject I represented, had a right to the information that was sought. It was doubtless perfectly competent for any of these authorities to have refused to me personally the insight that was desired into their respective shares in the great business of supplying London with milk, but they very kindly took my inquiries as having no personal object whatever, but as emanating from that justifiable interest of the outside public in the subject to which I have referred. Although perfectly aware that every Englishman's *house* is his castle, they knew that this rule does not apply to his *shop*. Customers have a right to enter there, and, indeed, are always welcome. They have to be satisfied, informed, propitiated; and, however able generally to take care of themselves, Government has made, and public opinion sanctions, so many interferences

on their behalf, that an inquiry conducted in their interest comes to be received with a civility and friendliness for which, in this particular instance, my best thanks are due.

It is the result of this inquiry that I have now to lay before you, and it becomes necessary in the outset to state the means of information which were open to me, and of which use was made. There was in the first place sufficient acquaintance with the experience of farmers in many of our dairy districts. I know their management, and personally many of themselves, in the Vale of Gloucester, in Wiltshire, Cheshire, Ayrshire; and I am thus sufficiently acquainted with the relation between cow food and dairy produce in the country. Moreover, the precise returns for many years of quantity and produce on the Frocester Court farm, Gloucestershire, have been published by Mr. Harrison; similar information has been published by Mr. MacAdam, of Crewe, and the results of prolonged investigations have been given by Dr. Voelcker. To any questions as to the quantity and quality of the milk produced under ordinary country feeding, there are thus sufficient answers. As to the quantity of milk supplied to London, the metropolitan railways have given me monthly returns of their imports—most of them for several years, all of them for several months. The clerks or inspectors of the 44 divisions in which the metropolitan district is arranged, have told me the number of their licensed cowhouses, and they and the Veterinary Department of the Privy Council have given me returns of the number of cows milked in them usually and at present. Thanks for the most part to the inspectors, to whom I was introduced by the medical officers of the several districts, I have examined cowhouses in the Hendon district, in the Islington district, in St. John's Wood, Marylebone, St. Pancras, the Strand, the City, Chelsea, Clerkenwell, in Bethnal-green, Mile-end Old Town, Belgravia, and Limehouse. I have thus seen 51 cowhouses in all, and in every case conversation with the cowkeepers, or their men has informed me as to the food given, the milk produced, and the risks and losses incurred. In one case, that of Lord Granville's large dairy, near Hendon, I have had the recorded results of several years' experience as to food and produce, expenditure, losses and returns, placed in my hands by Mr. Panter, his lordship's steward; and the corresponding figures for Colonel Talbot's equally large dairy at Sudbury have also been shown to me. There is, moreover, the corresponding experience to some extent of very large cowhouses for the supply of other towns, as for example, the large dairy on Mr. Littledale's farm at Birkenhead; the monster establishment of Mr. Harvey at Port Dundas, in Glasgow; several of the Leith and Edinburgh dairies; that of Mr. Hilder, near Woking; and of Mr. Collinson Hall, near Brentwood; from all of which particulars bearing on the subject have been gleaned. Then as to the trade in milk, I have been informed by Messrs. Marriage and Impey and Mr. Collinson Hall, wholesale dealers, who supply probably 100,000 quarts a week throughout the year; and by a very large number of retail dealers, both men who keep cows and sell their produce, and men who buy milk from the wholesale dealers to sell again; and I have had conversation with the men in charge of the railway traffic.

Lastly, as to the consumption of milk, the statistics of the milk supply to Stirling in Scotland, and Mansfield and Bedford, in England, have been procured for me as a sort of datum line for comparison, and a good deal of information has been received on the consumption of milk in country villages and families. Moreover, I have gone to institutions where the food of inmates has been under medical supervision, and where the dietary has been framed with a simple view to health, and I have to thank the officers of no fewer than 16 different hospitals, not infirmaries for the treatment of patients, but asylums, orphan-houses, schools, and workhouses, for the actual daily consumption of milk by many thousand healthy people, including 5300 children under 10 years of age, and 3000 adults. And, on the other hand, thanks to some of the benevolent people visiting in the district, I have obtained information of the milk consumption in two or three of the lowest courts in the Strand district, where it is hard necessity which dictates the maximum, not medical advice which limits the minimum, scale of feeding. Lastly, we all have in the report of Dr. Edward Smith to Government an immense mass of information on the dietaries (including milk) of the poorer classes throughout the kingdom.

Applying such data as we thus obtain to the population of London, we learn whether it can be considered well-fed or not as regards its milk.

Here the question of quality comes in. Starting with a very strong impression that London milk is almost invariably diluted, I am bound to say that as you make your rounds among inspectors, dealers, and even its producers, you find (with many an exception where you cannot doubt the thorough honesty of the retail dealer) that this impression is equally strong in those who are most closely connected with the trade itself. Milk, incapable of being kept, and with more or less of a variable supply, must be stretched by dilution, more or less, to meet even a constant demand, and still more is a stretch of this kind required to meet an uncertain demand, varying considerably from day to day. But indeed it matters very little to the nourishment of the consumer, and not much, I will add, to the conscience of the producer, whether this dilution of the milk be produced by the direct addition of water or by feeding the cows on watery and succulent food. I saw two cow-houses in St. Pancras, one of which was in a wretched plight, the cows being extremely dirty and fed on the very poorest food—great quantities of distillery wash and of grains, with a little Covent-garden refuse greens—and the other over-full perhaps of cows, which, however, were cleanly kept and well fed on hay and mangel and grains, with a little meal. I would rather have milk from the latter of these dairies, notwithstanding that coming to it unannounced at milking time, I saw a can of beautifully clean water standing conveniently near to the tins into which the milk was being poured. It is not, however, on mere inference from the necessities of the trade that the presumption of dilution rests. Many analyses have been published in proof of it. Dr. Whitmore, of Wimpole-street, who is the medical officer of the Marylebone district, has been good enough to give me analyses which he has made, proving both the honesty and dishonesty of the instances examined. Dr. Druitt, of St. George's, Hanover-square, has given me the results of nearly 100 analyses by himself. Dr. Voelcker has made many analyses of town and country milk, and he has been good enough to make several for me, of milk collected from consumers in the low courts to which I have alluded; and Prof. G. T. Brown's microscopic examinations of milk, as published in the *Quarterly Journal of Science*, and in the *Agricultural Gazette*, also throw light on this subject.

I think, then, that on the whole, a good deal of information has been collected on the quantity and quality of milk supplied to London, and on the costs and risks and produce of its manufacture; also on the consumption of milk in London as compared with other places, and the risks which the consumers of it as well as its producers run. Of course the great gap made in our produce by the cattle plague could not fail of being noticed. Its relations to the present and the future supply of the metropolis have been to some extent discussed in the recent "Blue Book," issued by the Cattle Plague Commissioners, and will no doubt be further discussed this evening.

This, then, is the material which has been gradually collected during the past three months. All the documentary part of it lay unread until time offered for its arrangement a few days ago, but of course inspec-

tions and conversations have been all along gradually influencing and forming the opinions, which on the whole I believe them to justify. Looking at the thing itself, and if possible at my own relationship to it entirely from the outside, just as I have weekly had to do with agricultural evidence of all kinds for many past years, it must, I believe, be admitted that we have here a good witness, with sufficient previous knowledge and sufficient practice in the work of inspecting and reporting agricultural matters to materially reduce the risk of his being misled by what he saw and heard—and with sufficient interest in the subject and sufficient indifference as to the lessons it might teach to make him at once industriously gather facts and ungrudgingly accept any conclusions which they fairly indicated. Of course no one with any previous knowledge of a subject comes altogether unprejudiced to a further study of it; but I can unhesitatingly declare that, in studying this particular subject, I have not cared one jot what the truth might be, and that I had no personal end to serve during this endeavour to discover it. My prejudices were those of a countryman—that cows are healthier and better, and yield the best and wholesomest milk in fields—that London cow-houses are a nuisance to be abated, and that they ought to be all removed outside—that the best way of supplying a large town with milk is to bring it from the country—that it is more reasonable, cheaper, better, to carry 10 lb. weight of milk from a country farm to the town-consumer's door, than to carry 60 lb. or 70 lb. of green and other food from that farm to a cow-house close by the consumer, there to convert it into the 10 lb. of milk which it will produce —and, finally, that Londoners are worse fed with milk than any considerable body of men, women, and children elsewhere in the island. The whole inquiry, I am bound to say, has led me very materially to alter these impressions. I now believe that London cow-houses need not be a nuisance—not so great a nuisance certainly as London stables—I believe that the milk made in them is better than what is delivered at the railway stations from the country—that it is a wiser, cheaper, and better thing to carry mangels, grass, and hay the few miles needed to the town than to carry one-sixth their weight of the milk they yield 20 or 30 miles from the country. I believe that cows in London cow-houses are and may be healthily and comfortably kept—nowhere more so, and that the risk of loss by disease, so far as regards the manner of their food and lodging, is not greater here than in the Gloucestershire and Cheshire pastures; and I believe that hitherto, in point of fact, London has been better fed with milk than the average of south country villages.

These conclusions will startle and perhaps disgust some who may have come here expecting a wholesale condemnation of the London milk trade, with all its presumed abominations of filthy cow-houses and adulterations. I believe, them, nevertheless, to be inevitable by any one who shall give sufficient time to a fair examination of the subject. They are the conclusions simply of an agriculturist anxious that the best food should be produced and offered to the consumer. Medical men, who are professionally interested, not only in people being well fed, but in their being kept free from active sources of injury to their health, may insist upon it that animals using and spoiling so much more air than men, should not be permitted in densely-populated districts. And I can understand the outraged feeling with which the medical officer of a district, having power given him to reduce the number of human inmates of a tenement within certain limits, and exercising that power unhesitatingly for their good, finds himself, as in instances known to me he has been, thwarted, when he endeavours to secure the dismissal from a thickly populated district, of animals such as cows, which individually vitiate so much more air than is spoiled by men. But this is not my subject; all I have to do with is how to secure the best supply of milk to a densely-populated district.

Dismissing, therefore, this aspect of the question, (though I can see that it will be strongly, perhaps indignantly insisted upon in the subsequent discussion), I will state once for all, that while the facts are in favour of the milk being made near the consumer, and while there are a sufficient number of well-managed cow-houses in the town to prove that a cow-house need not be so great a nuisance as a stable to the dwelling-house next door, yet the conditions of the best arrangement are no doubt best observed when cow-houses are situated in the immediate outskirts of a town, not within its boundaries. It may, however, be usefully remembered, as regards the metropolis, that a cow-house, one-storied, with an animal to every 40 or 50 feet of surface, and giving, as it almost always does, upon a yard, will not, advantageously to human health, be replaced, as it legally may, and probably will be, with a building covering both ground-plan and yard, with dwelling-houses four or five stories high, and perhaps whole families in each.

I proceed now, therefore, to the facts of the case, and, leaving a great deal of tabular matter to be read in the *Journal*, I hope the story may be told without boring you much with figures.

Country Produce.

Of *Country Produce* I have not very much to say. The herd, averaging 65 cows (fair country Shorthorns), at Frocester Court Farm, Gloucestershire—fed on grass and hay, with roots and straw in winter—produced, according to Mr. Harrison's careful records, 245,458 gallons of milk in seven years, or 535 gallons each cow per annum. Mr. McAdam, of Gorsty Hill, near Crewe, who has long been known as an experienced dairyman, tells me that during the past four years 64 cows (Ayrshires) on his farm have averaged 530 gallons each. Taking the Gloucestershire experience as our guide:—For every 100 acres (22 being arable, as ascertained by Mr. Harrison in the case of 23 farms) in a district where the average crop of meadow hay is probably 28 cwt. per acre, the stock kept is about 20 cows, four 2-year olds, four yearlings, four calves, 20 sheep, and three horses, equal in consuming power to about 32 cows. The hay crop represents perhaps rather less than 7 tons of grass, and the aftermath (at ⅓ the first cut) is probably less than 3 tons per acre. The whole cattle food of the 100 acres, half the arable land being taken as in turnips and clover, may thus be put at 900 tons of grass, or 28 tons of green food per cow per annum, equal to 170 lb. of grass a day to each. This, however, is where the grass is depastured—that is fed in the most wasteful way; and it is probable that if the calculation had had to deal with the case of house-fed cows, it would appear that 150lbs. of green food daily, of the quality of ordinary meadow grass, or its equivalent, would suffice for ordinary Gloucestershire dairy cows. Putting, however, 530 gallons of milk against 28 tons of this green food, we have 1 lb of milk to every 11 or 12 lb. of grass, or as nearly as possible 100 gallons of milk to every ton of hay. If the consuming value of hay (*i.e.* the price at which it can be grown at a fair profit to be consumed upon the land) be 60s. or 70s. a ton, then the milk can be produced in Gloucestershire to be sold at 7d. to 8¼d., or say 7¾d. per gallon. And to this the dairy statistics of other countries pretty nearly correspond. The figures from a farm near Christiania, published in the *Agricultural Gazette* (p. 102, 1863), show that in 1863 and 1864, taking the average of the two years, 41 cows yielded 27,000 gallons in the year, or 630 gallons each, consuming during that time, in all, 229 tons of calculated hay value, viz., in grass during 120 days of summer, and turnips, hay, and chaff, with a little oilcake during the other 245 days of the year. This is at the rate of 100 gallons for every 17 cwt. of hay, or about 6½d. per gallon for food alone. But the cows (Ayrshire and country cows) were at least 100 gallons above the average in their annual produce.

Sixpence-halfpenny or 7½d. per gallon, however does not cover the risk of loss by disease and death.

Mr. Palin, of Stapleford, near Tarvin, Cheshire, tells me that his loss during 20 years over a stock of 50 cows was about 5 per cent. in general, 60 per cent. during two years of the time, and 15s. a cow for loss of milk on four separate occasions. Putting all this together, his loss has been £86 a-year over the 20 years in question, or nearly 12 per cent. on the value of his stock.

Mr. McAdam tells me that, out of 1,500 cows which he has had through his hands in country dairies during the past 15 years, 19 have died and 35 have been sold at a loss of £9 each, from pleuro-pneumonia; two have died from foot-and-mouth disease; and 21 have died from other causes. The foot-and-mouth disease, moreover, attacked 200 cows in this time (killing in one per cent. of the cases), and resulting, probably, in a loss of 10,000 gallons of milk. The whole loss must have exceeded £1,300 or £1,400 in the 15 years, much less per cent. than the other quoted case. And to the cost of food, 7¾d. per gallon, there must therefore be added from ⅓d. to ½d. per gallon, for that is what the loss comes to over 1,500 times 530 gallons, making the cost of milk, to those who make it from grass and from hay at about £3 per ton, at least 8d. per gallon. If cows are sold after seven or eight months' milking, it will be at the cost, on such feeding, of probably £5 or £6 ahead to replace them with others just calved, while the consumption of food would probably be rather larger per annum. The produce, in place of being 530 gallons, would be, at least, 730; and the 200 extra gallons being obtained at the cost of this £5, or at 6d. a gallon, the whole produce of the year might not cost more than 7d. a gallon; but the risk from infectious diseases would be very greatly increased—more than doubled or tripled by the constant change of stock; so that in all probability milk would not be obtained much more cheaply thus than under ordinary country management, where cows are kept for five or six years upon an average, and fed in the summer time in pastures, and in winter time on hay and straw and roots, with access to both field and shed. Of course, when the object is to produce milk for London, as on many country farms a long way from town is now the case, they find cheaper, and, for their purpose, better food than hay, and they will adopt more economical management than grazing dairy cows in growing grass. And though I hear that in the Aylesbury district, hay and grass and roots and grazing in the field up till November are still the rule, yet no doubt ultimately brewers' grains and cut grass, and succulent food of all kinds given in sheds, will become the rule outside the town just as they are the rule within. Human nature is a pretty constant quantity, whether it be town or country bred; and countrymen who engage in contracts for the supply of milk to London dealers very soon find out the cheapest way of producing it in the largest quantity.

That way has long been studied and worked out with all the earnestness which self-interest inspires. You will meet in London with men who have been engaged in the business for 30 and 40 years, with a staff of servants, too, who have been in their employ almost as long. When the St. Pancras committee went round to inspect the cow-houses of the parish, and to condemn especially all of them which were in any way connected with dwelling-houses, they were met at the door of one to whom they announced the decision against him with an introduction to his grandfather and his father, then living with him, both of whom had carried on the business there before him. "And here, too, are my children, gentlemen—four generations of us. It does not look as if the cows had been injurious to health, although so near us." Of course where a business has been carried on for such a long series of years, and men come to it in this way with inherited ability, as you may say, and there has been a long experience of all kinds, both prosperous and adverse—they cannot have much to learn of the best way to supply the demand for milk, even though the production of it be carried on under the great difficulty, as one would think it, of their long distance from green fields. But indeed this is no difficulty at all. Even in the midst of green fields the cowkeeper finds it the best policy for the production of good, abundant, and wholesome milk to keep the cows in houses; and in London, where the supply of brewers' grains is so abundant, it being the constant food all the year round wherever milk is produced for direct consumption, where large markets for mangels and for hay exist, and where grass can be supplied in abundance during summer at the cow-house for 20s. to 25s. a ton, the means of keeping cows are especially good. Here, too, we have that guarantee of the quality of milk which is afforded by a high premium on keeping cows in good condition; there is here the best market in the world for cattle of all kinds, if they are fit for the butcher, and probably as poor a market as there is anywhere for poor dry cows; moreover the risk of infectious disorders—necessarily greatest in the crowded cow-house, makes it especially necessary for the town cowkeeper to keep his stock in fattening condition, that they may be disposable at a minute's notice. And all these circumstances secure the best feeding being adopted here—much better feeding than satisfies the ordinary country dairyman. I have no doubt, therefore, that the milk yielded by a London cow is better than that which the same cow would produce under ordinary Gloucestershire or Cheshire management.

London Cow-houses.

What, then, is a London cow-house? and what the nature of the manufacture—as we may fairly call it—which is carried on in it?

A London cow-house may be, and often is, a piece of ill-conditioned, rather ricketty old stabling, with a sort of brick-built manger on the floor, the length divided by short and scanty stall divisions, 7 feet or 7½ feet apart, furnished with ropes or straps or chains, with running rings, so as to tie up two cows between each pair. This floor is roughly causewayed, and there is a gutter lengthwise down it, parallel with the manger, and a little more than a cow's length from it. The house may be only wide enough for a single row of cows, or there may be one on either side, with the gutter between them for the drainage of both. I am now referring to the average style of the smaller and inferior cow-houses in the city, and in the poorer districts of the metropolis. You come upon one from some street of third-rate houses through an archway, perhaps under a dwelling-house, which leads you into a small back yard, half filled with this poor shedding. There may be a small pit for the dung, a store of some sort for the grains; and the small quantity of hay and roots which are kept on hand are stowed away in any convenient corner—at present there is room enough—for a full cow-house, even of this small class, in London now is a very rare exception. The roof is either low, with plenty of ventilation through its loosely-lying tiles, or if higher, there is a "tallet" or floor overhead where hay and other food is placed, and in which wide spaces are left next the walls and over the heads of the cattle, and then the space of this upper room is measured into the 1,000 cubic feet per cow, which is the rule that must be observed (for instance, in St. Pancras) if the cowkeeper wishes to avoid being opposed for a renewal of his licence. There are window places, which at this season of the year are closed, perhaps with a bit of sacking nailed over them.

This, then, is the ordinary style of a small cow-house—such as the majority of them are. You find in them six or eight or ten capital short-horn cows, or perhaps here and there occasionally along with them a few black and white Dutch cattle. It is either a clean and tidy place, where both the cowmen and their stock are clean and dry and comfortable, everything in its place, the animals all lying down, having comfortably fed, and the air with no other perceptible smell than that of the chloride which

the careful owner sprinkles once or twice a day along the gutter—*or*, it is a filthy hole. In some cases (generally in Bethnal-green) the dung pit is boarded over with a loose slab, to be replaced after every fresh addition to its contents, and the yard is clean and orderly and sweet. In others you will find the dirty straw, originally purchased after use in a neighbouring stable, spread abroad to dry and clean itself over poles and hurdles for repeated use as litter. In some, fresh grains, good mangels, and the best hay, with oilcake and peasmeal—the very best of cow-food—are kept tidily, and served out regularly and neatly, and the whole management is punctual, clean, and systematic. In others you will find a bin of sour distillery wash, and a heap of stinking turnip-tops and cabbage refuse, and the whole place dirty and offensive. In general the accommodation—limited as it is—is quite apart from the dwelling-house, but there are exceptions even to this. There is a cow-house in the St. Pancras district, otherwise well kept, which is the lower apartment—cellar it may be called—of a dwelling-house, though it opens on a yard descending to it from the street; it is 16 feet square and 7 feet high, barely 1,800 cubic feet in all, and now holds 2 cows—formerly it held 11—its licence is not to be renewed. There is another in the Strand district not so cleanly kept, where the shop or dairy is approached through the removal, as it were, of the ground-floor front room, which is thus laid open to the street, and as you walk through it you look down the central opening upon a cow-house of considerable size in the cellarage, where there is accommodation for a dozen or more—only three being there at present. Such then is the smaller but most numerous sort of London cow-house.

Go a step higher, and you come upon a class of men, many of them also occupying small farms near town, all of them employing very considerable capital, which has, however, largely disappeared during the past autumn, under the ravages of the plague. They keep 30, 50, 80, or more cows apiece, and these are lodged either in larger establishments of the kind already described—not unfrequently ram-shackle old buildings with yards attached, either with double-roofed cow-houses, or covering a square, sometimes with a floor overhead, and at others, open to the roof, where the cows are arranged, first around the walls, and then in a square block head to head in the middle.

Sometimes there are parallel rows of roofing together covering a square, and double rows of stalls under each. And here, too, there is the same variety of management as to cleanliness and order. I could point out some samples even of this higher class, which are unquestionable nuisances, and others as clean and sweet as a parlour; for in this middle class of cowhouses, as they may be called, there are examples of the very best style of cow accommodation.

In Chelsea, there are many examples where cows, as good for milk as any in England, are as comfortably housed as you shall find them anywhere—in sheds open to a clean and airy yard during summer, but provided with hanging flaps and doors for winter time. For example, you may enter through a wide gateway a passage roofed with glass, covered with vine-leaf, and sometimes grapes, leading you to a well-kept yard, with clean and comfortable cow-shed on one side, and stabling, hay-house, and food-store on the other, and an inner cow-house further on. Both shed and house are filled with first-rate large-framed, fleshy Shorthorn cows—fed on grains and hay, and mangels, meal, and cake in winter, and vetches or grass, and grain and meal in summer time, and the master, in the highly-polished shop and dairy on the premises, hands you testimonials from half the titled families in the west to the quality of his milk. Or you may enter a larger yard in a poorer neighbourhood, and find shedding closed against the winter, providing as good accommodation, in single rows, for as good a herd of dairy cows as I ever saw—cleanliness and order being apparent everywhere. Or you may pass from a well-kept mews into a lofty, clean, and, though ceiled, well-ventilated and well-drained apartment, at least 12 feet high, with, I should suppose, 60 square feet of standing ground to every beast—warm, well-watered, and well-fed. Where could cows be more comfortably kept? In every instance I am describing actual examples.

In Marylebone you find, in a good street, a corner shop, where the side road leads to a well-kept first-class mews. The master takes you through his three-storied cow-house, as you may call it—and first into an apartment for 12 or 16 cows, which is the quarantine station through which after some weeks' trial they pass into the other rooms, one directly over head, reached by a sloping gangway, and the other along-side, but lower down. The floors are all closely bricked in cement, the upper one being laid on brick arches, and the drainage is everywhere perfect. I may refer personally to Mr. Drewell's establishment at No. 6, Upper Weymouth-street, for the example of intelligence and pluck with which great losses have been met by him, and further losses have been resisted. He has taken special precautions against infection, and shown extreme care in destroying it whenever it appeared. The whole of the brick flooring has been taken up, disinfected and relaid. The plan of tarring the noses of the cattle, so as to disinfect the very air they breathe, was adopted, but ultimately abandoned for the neater plan of nailing on the wall before them a wide strip of absorbent deal well soaked in creosote. Iron having been pronounced a remedy or preventive, the well upon the premises was thoroughly chalybeated by throwing in old iron, and every possible device was used to insure the perfect sweetness of floor and food and air. I can assure this meeting, containing no doubt many countrymen, that they will nowhere find better, cleaner, neater, and sweeter cow-houses than, taking these examples as an illustration, may be kept and are to be found in London streets.

Lastly, I come to the larger establishments; and Mr. Drewell, holding a couple of large cow-houses, and originally milking 140 to 150 cows, of which, however, he has since lost 100 by the plague, might have been referred to under this division. I refer, however, now to the largest houses, where 200 cows and upwards have been generally milked. And here, too, you find two classes of establishments—houses, on the one hand, where you can touch the ceiling, dark and dirty, and crowded with unfortunate beasts; or where, in spite of ample space and lofty roof, the poor cows are comfortless and filthy—and places, on the other hand, where the accommodation is first-rate, roomy, clean, and comfortable—a single cattle shed, it may be, like Mr. Camp's, in St. Pancras, in the midst of a large and roomy yard, 90 yards long and 26 feet wide, with a broad gangway between two rows of cattle—or several sheds, clean, dry and warm, each well managed, placed at intervals in a clean and spacious yard, such as Mr. Veale's first-rate establishment, in the Acacia-road, St. John's-wood.

Such then are the London cowhouses, of many sizes, and of at least two styles of management, in one of which a daily cleansing of the whole establishment, dung pits included, insures perfect order and condition, and in the other muddle and dirt easily create a nuisance.

Let me here state it as a mere matter of fact, that the fatality and even the advent of the cattle plague has had no sort of connection or relationship with the condition of the cow-houses where it appeared or where it did not appear. Anyone going round the London cow-houses to study the cattle plague in them, is thus forced to the conviction that it is the result of some new and special poison which has been introduced. The largest, cleanest, best managed cow-houses have been swept out, and the filthiest holes have in many instances escaped. In Bethnal-green you come repeatedly on small cowkeepers who have lost their all, while close by are others who have not suffered, and there has been no difference whatever in their management. Mrs. Nicholls' cow-house (Laycock's dairy), Islington, where the disease

first appeared, a large and roomy, clean and well-kept place, lost all its cows, and a second lot bought in immediately were also carried off. In Mr. Camp's capital house the disease appeared in a couple of instances, and the whole stock was immediately sent to market. Only the other day, on applying at the Vestry of Mile End Old Town, for an introduction, through the inspectors, to the cow-houses there, I was told, "One of our largest men, Mr. Alexander, is so particular that he won't let you come in if you have been to any other cow-house in the district." I called on Mr. Alexander, and found that the disease had appeared or threatened in a case or two in his well-kept establishment, and he had immediately sent the whole of his stock to market. One cow-keeper in St. Pancras—a capital fellow I know he is, for the hearty way in which he stands under the heavy losses he has suffered, had two cow-houses, one lofty, large, and roomy, the other offering very dilapidated, low, and poor accommodation. The cattle in the good house died, and the plague has never entered the other. One of the dirtiest cow-houses I know in London, where cabbage refuse, stinking wash, and dirty stable-dung for litter, combined to make as filthy a hole as ever cows were kept in, not far off this place, had not then been visited. Where indeed will you find a better illustration of the same kind than is afforded by Lord Granville's well-kept, lofty, roomy cow-house at Golder's-green, in the midst of green fields. It was as bad a case as any of losses by the plague, and his 100 cows, among the best kept in London, were among the first to suffer.

I may here add that as a general rule the London cowkeepers have shown great energy and resolution in combating their new and dreadful enemy. You smell chlorine in the cowhouses almost everywhere, and the interiors are generally fresh lime-washed at intervals. Where the disease has occurred, the flooring has been grubbed up and disinfected with both chloride of lime and caustic lime, the whole place has been scrubbed and lime-washed, and sufficient time has generally been allowed to pass before fresh cows were brought in.

The Milk Produce.

Such being the cowhouse, what is the manufacture carried on in it?—In order to the profitable conversion of cow-food into milk, you must make use of the best animals in the right constitutional condition, you must feed them well, and you must keep them warm. Fresh-calved short-horn cows or animals of the black and white Dutch (a good dairy) breed, are therefore selected. They are fed on grains, hay and roots in winter, and grains and grass in summer, and watered regularly. In many dairies meal or bran is also always given daily to the cows, and in some it is given very liberally, but when in heavy milk they almost always get a quart of pea or barleymeal, or half a peck of bran thrown in with their grains, morning and evening, and when shrinking their milk after being six or seven or eight months at the pail (and there are examples spoken of and sometimes seen in almost all large dairies where cows milk on without breeding for one and two and even a third year) they receive cake and meal to get them fat as rapidly as possible. They are sold, you may say invariably, to the butcher, at such time as, considering the demand for milk (for to the last they are giving some), or the state of the market, is most convenient to the owner; and freshly calved cows are bought in their place. The average time a cow remains on hand varies exceedingly. In order to keep 100 stalls full of milking cows, 100, 120, 150, 170, and even 200 are annually bought, making in the several instances the average length of time during which a cow is kept in milk, 12, 11, 9, 7, 6 months respectively; and rarely are they calved down and kept on a second year. The loss upon the exchange varies very much, from £2 or £3 to £4 and even £5 a head, and that corresponds of course to much more per stall, *i.e.* per cow actually in milk, because there may be 150 of these exchanges in the year for every 100 cow stalls. It matters nothing whether you take your examples of management from the country or from the town, for the management and experience are alike in both. I give therefore the following figures from Lord Granville's dairy farm at Hendon, and from Colonel the Hon. W. P. Talbot's farm at Sudbury. The former had a good deal of loss from foot-and-mouth disease and pleuro-pneumonia during the last two or three years, and the latter has been in perfect prosperity; the former represents average management as to feeding—the latter represents the highest feeding, and thus the average of the two may fairly represent the average of the town dairymen.

Mr. Panter, his lordship's steward, tells me that they milk from 90 to 130 cows, averaging 100, 108, and 120 cows respectively in the years ending Midsummer, 1863, 1864, and 1865 respectively. Taking the middle year of these, to keep 108 cows in milk they sold 161 for £2,317, or £14 14s. each, and bought 163 for £18 18s. each, losing £4 4s. apiece by the transaction, but more than £6 per stall or cow kept milking. The milk sold during that year fetched £4,300, which, at the price it realised, 1s. 10d. per barn gallon, corresponds to 93,818 imperial gallons, or 868 gallons per cow in constant milk, *i.e.*, per stall; and this is 9½ quarts a day upon an average. They received daily 1¼ bushels of grain apiece, 15 lbs. of hay, and 30 lbs. of mangels during winter; and in summer the grains with grass, viz., ¼ of an acre of a crop equal to 30 cwt. of hay as the daily ration of 120 cows, which may thus be said to have eaten rather more than 1 cwt. apiece, Besides all this, 4 lbs. daily of pea or other meal were given with the grains as the cows began to fail in milk; so that when they fell to perhaps 5 quarts of milk a day they were fat enough to go to the butcher. In three years, the stock being 100, 108, and 120 cows respectively, the return was £3,900 to £4,300, equal in all to about £40 per stall under this feeding; from which has to be deducted a yearly loss of £6 or £7 per stall to keep the stock of constant value.

During these years, however, the herd suffered frequently from foot-and-mouth disease, and occasionally from pleuro, so that forced sales and diminished yield were frequent, and thus the loss of £4 4s. per head, or nearly £7 per stall, is no doubt very much larger than it is in the average of town dairies. In Colonel Talbot's dairy at Sudbury, where the feeding is higher and there had been no disease, they milked about 80 cows, and sold 153 in the course of last year; purchased for £19 10s. apiece, and sold for £18 10s. apiece upon an average, so that there has been a loss of about £1 per head or £2 per stall; and the returns here are £4,090, which at 1s. 10d. per barn gallon represents 89,236 imperial gallons, or nearly 1,100 gallons per cow in milk, which is close on 3 gallons per stall a day. Here the feeding included meal of various kinds, 3 or 4 lbs. a head daily throughout the year, and the cows, bought at an average of £19 10s., are of first-rate quality.

I have here a table, giving the daily rations of a cow, and in some cases the actual, but generally the *estimated* daily return of milk in 14 of the instances examined by me, a dozen of which are strictly town dairies The letter F, opposite the entries of meal or food, indicates that in these cases it was given only to fattening cows, in others it was given continually. It will be seen that the grains given vary from ¾ of a bushel daily to as much as nearly 2 bushels a day; the hay from 6 lbs. to 15 lbs.; the roots from 25 lbs. to 60 lbs.; and cake or meal from nothing up to 5 lbs. apiece, given regularly, or to from 3 to 5 lbs. given only to fatting stock. And the daily produce per stall, *i.e.*, per cow in milk, is estimated at from 9 to 12 quarts daily, a difference not greater than has actually existed between Lord Granville and Colonel Talbot during the past few years. Distillery wash is only mentioned once in this table; it is, however, given in many dairies of all sizes at from 4 to 10 or 12 gallons daily—generally mixed up in a mess with grains and hay chaff, and sometimes meal.

No.	Cows milked.	Cows bought per annum.	Loss on sales per stall.	Daily winter rations of a cow.					Daily produce of milk per stall.
				Grains.	Hay.	Distillery Wash.	Roots.	Meal or cake.	
	No.	No.		bsh.	lb.	gal.	lb.	lb.	q'ts.
1	186	160	£7	1½	15	...	30	3 (F)	9½
2	80	150	2	1½	?	..	?	4	12
3	40	40	?	1	14	...	40	2 (F)	10
4	66	76	?	1	?	...	42	?	9½
5	10	?	?	1½	12	...	60	2 (F)	?
6	160	150	?	¾	9	...	56	3	?
7	20	?	?	1	6	...	56	3	?
8	?	?	?	1	14	...	28	{pint condiment}	12
9	50	100	?	1	12	...	28	peck bran.	12
10	?	?	?	1½	9	...	28	pint meal	9½
11	?	?	?	1½	15	...	30	?	12
12	50	75	?	1	14	...	25	5	10
13	?	?	?	1½	7	...	60	4	9
14	?	?	?	1½	11	6	42	3	10

The summer ration is grass as much as they will eat, grains, and a little meal.

I must now compare food and produce here, as I did in the case of country milk. Putting hay at £5 a ton, grains at 3d. a bushel, meal at a 1d. per lb., and roots at 20s. a ton—the mere food of a town-fed cow may be said to average 9s. or 10s. a week, it is often as much as 12s., and the milk from this food, at 2s. a barn gallon, is worth 17s. 6d. a week; out of the difference the cow-keeper has to pay for rent and labour, and for the cost, under natural deterioration and occasional disease, of keeping the stock good. There are no actual records attainable on a sufficient scale of time and number to be trustworthy, but I believe that the disposal of at least one in every ten of the cows that are bought is a forced sale. This is mainly owing to the occasional sweeping attacks of pleuro-pneumonia which are suffered. The first symptoms of its approach are always carefully watched for, and the animal is at once sold to the butcher at whatever sacrifice. The loss per stall is, in the case of many a cow, nothing whatever from these changes—under good feeding the stock is often kept at stock value for milking purposes without loss—but taking forced and hurried sales into account, the loss can hardly be considered less in general than £5 a year per stall, or 2s. per week. For 12s. a week these animals may be kept to yield 17 or 18 gallons of milk, which is at the cost of about 9d an imperial gallon. I cannot tell you in detail what the expense of rent and labour on the average of London dairies is. These items, and fair profit too, were considered in the assumed price of hay upon the country farm; but, adding rent and labour, and fair profit to the cost of keeping stock in food and health in towns, the wholesale price of 1s. an imperial gallon does not much exceed the total cost of it. The expense of labour must be very considerable, and the life generally is a hard one, both of the labouring men and of the master, who generally shares it and always superintends it. Let me describe a day's experience of it. You rise at 4, clean out the house, and milk the cows, taking probably 12 to your own share. The milk is taken from you to the dairy, and there placed in the cans in which it is carried round to customers. You then feed the cows with half a bushel of grains or more to each, with perhaps a quart of meal in it, or half a peck of bran, or it may be no addition at all. I have met with the use of spiced meal or condiment in two or three cases, at the rate of half a pint to each. You give them a bit of hay apiece, and you then sweep up the house and, if it is a small business, you go to undertake the labour, or at least a share of it, of carrying round the milk and crying it along the streets. At eight o'clock you breakfast, and at nine the cows are watered, and perhaps 12lb. of mangels and another lot of hay, 2 lbs. or 3 lbs. a-piece, are served round, and then they are swept out, and left till milking time again. This is at one o'clock, when the place is again cleaned and the gutters swilled out, the cows being milked and fed on grains and hay as before, and you then go round with the milk again, come in and give them roots and hay and water, and litter them, and leave them for the night. Or, take the example of a farm 20 miles from London; I quote the letter of a correspondent:—

"We begin milking at one o'clock in the morning; each man should have fifteen cows. The milk arrives at five o'clock in London. The cows are again milked at ten o'clock, and the milk is in London at one o'clock.

"They are fed as follows:—each man gives about 4 lbs. of meadow hay to his fifteen cows, and then goes to bed. At seven o'clock he mixes ½ bushel of grains with a bushel of sweet chaff, and a handful of salt; the cows are then cleaned and fresh littered; 2 lbs. of hay given, and at eleven o'clock 1 lb. of mangel is given; at four o'clock p.m., 1 bushel of grains and chaff; and at six about 2 lbs. or 3 lbs. of hay. The cows are not untied, that they may not mix together, and their water is carried to them. I have never seen them more healthy than at present, or giving more milk. We feed often, and not large quantities at once.

"Lime on the floors, and gas tar enough to be not offensive, and ten drops of arsenicum (3rd dilution) in their water; great cleanliness, and all their provender good; not putting too many in one shed; good ventilation at the top; no draughts. These are my precautions.

"The London milk usually sold," (he says, and he ought to know) "is about one-third water, but there are some that make up a compound, one-third being milk. I am informed the French police inspect the milk vended in Paris. Could not this be enforced for London?"

So much for mere labour—and how much for trouble and anxiety of mind, for the cowkeeper has to deal with one of the most excitable and sensitive of animals, and his mode of keeping her on the richest succulent food, and, if possible, in constant summer warmth—for the warmth of the cow-house is a point of great importance to its productiveness of milk—goes no doubt to increase this actual sensibility to the utmost. Moreover, he has to deal with one of the most easily spoiled and sensitive of commodities. Everything may be said to be in the condition of ticklish equilibrium—a breath of infection may sweep the cattle stalls to ruin, or at any rate to almost ruinous loss; a passing thunder storm or blast of hot air may spoil the contents of the dairy. I say that if milk is delivered to the purchaser as the cow delivers it to the pail, the cow-keeper wins his profit out of more labour and anxiety than almost any other manufacturer or tradesman. And unquestionably the milk very often *is* delivered genuine, for the milk dealers who give 2s. a barn gallon (less formerly, but more at present) often come and milk the cows themselves.

Quality of the Milk.

Now therefore for the question of quality. It cannot be doubted that with the feeding which it is the interest of the cowkeeper to adopt in town, the quality of the milk must be first-rate, and analysis has often proved it so.

I have here an analysis of a sample, not taken from the cow, but I am thankful to be able to say, for it is very good, impounded fourteen days ago at a poor door in a poor court in the Strand district. It contained 12 per cent. of cream and 3.84 of pure fatty matter, and was undoubtedly a genuine and first-rate milk. This single fact will prove that not merely the dealer who buys it from the cowkeeper—not merely the retail shopman who buys it from the dealer—but the poor consumer who buys it from the servant of the last-named man, and on whom therefore the risk of an accumulated dishonesty falls—do sometimes get milk pure. I must, however, frankly confess my belief that this is a very rare exception to the general rule.

The following table gives examples of nine analyses which Dr. Voelcker has been good enough to make for me

for the purpose of this report, all of different samples, from different courts and poor quarters in the Strand district. All except No. 5 were exceedingly, many of them shamefully, adulterated.

Composition of Five Samples of Milk.—Strand District.

	1	2	3	4	5
Water	93·75	93·04	90·98	93·32	88·38
Pure fatty matters	1·72	2·25	2·58	1·69	3·84
*Caseine (curd and a little albumen	1·75	1·75	2·50	1·69	3·18
Milk sugar	2·13	2·57	3·41	2·64	3·90
Mineral matter (ash)	·65	·39	·53	·66	·70
	100·00	100·00	100·00	100·00	100·00
*Containing nitrogen	·28	·28	·40	·27	·51
Per-centage of cream by volume	4	6½	6	4½	12
Specific gravity of milk at 62°	1·019	1·017	1·021	1·020	1·030
Specific gravity of skimmed milk at 62° F	1·020	1·019	1·023	Not determined.	

Partial Analyses and Determinations in some Samples of London Milk.—Strand District.

	6	7	8	9
Specific gravity of milk	1·018	1·022	1·021	1·021
Percentage of cream by volume	5½	7	6	5

Samples from Kensington and Camden-town.

	Kensington.				Camden Town.
	10	11	12	13	14
Specific gravity	1·029	1·029	1·025	1·023	1·019
Percentage of cream	8½	Not yet made.			5
Percentage of water	...	...			93·26

It will be seen by the reader of this table that, in eight cases out of nine in the Strand district, the milk was diluted up to 40 or 50 per cent. with water. In Kensington and Camden-town a somewhat smaller proportion was found to be adulterated.—In a late report to the Marylebone vestry, Dr. Whitmore, the medical officer of that district, refers to the general results of analyses by himself, from which you gather that out of 20 samples indiscriminately purchased, there were only eight adulterated, and of the others some were particularly rich, containing 10, 11, and even 14 per cent. of cream. Dr. Druitt, in one of his quarterly publications, as medical officer for St. George's, Hanover-square, speaks of 82 analyses made in the autumn months of 1861, of samples purchased indiscriminately from 46 dealers all over that parish, and of these 22 provéd to be "reasonably good;" 24, though probably genuine, were poor; 23 were of extremely low specific gravity from the addition of water, and three were in such a condition (it is supposed from artificial treatment), that they would not coagulate with rennet, and were probably therefore unfit for children. As to the specific gravity test, Dr. Whitmore alleges its inadequacy, owing to the fact that water as well as cream is lighter than milk—so that a low specific gravity may be due to the excess of either one or other of these very different ingredients—but Dr. Voelcker informs me that cream, though lighter than milk, is heavier than water, and therefore, excepting the case when water has been added in well-devised proportions to *skim milk!* (and when, therefore, the adulteration must be obvious at once) the specific gravity test may be depended on.

There are, I believe, cowkeepers in this room who know, from their own conscientious management of their business, that genuine milk is to be had in London shops—and, remember, I have not been speaking of the impossibility of individual consumers, with a personal knowledge of those with whom they deal, getting good milk—it is of the supply on the whole of the millions of the metropolis that I have been speaking—and I believe that cowkeepers will universally admit that, generally, it is watered. The popular prejudice on this point is no doubt correct. As to the other popular prejudices, however, connected with the subject—the idea, for instance, that chalk is added. the outrageous idea that "brains," as we have heard, and other filthy animal jellies are added, they may be dismissed as utter fiction. I have never met with a chemist who has detected chalk in milk; and to anyone who knows how difficult it is even in country houses to keep good milk sweet for any length of time, the idea of any other addition than pure water is absurd. I am not here to defend nor yet to condemn the London milk trade, but simply to tell the truth about it, regardless whom it may affect, and I have no doubt the truth is, that the milk (probably in the majority of cases) which we drink in London is diluted, nor can there be the slightest hesitation in declaring that this dilution, supposing it to be practised and denied, is dishonesty morally equivalent to theft; so also is the sale, as new, of milk that has been skimmed. Well, gentlemen, how are you going to avoid being cheated in this way? Are you going to depend on milk brought in from the country, or, perhaps, on the large and wholesale management of monster cowhouses by great companies, under the guarantee of gentlemen of unimpeachable honour, and under the skilful direction of distinguished veterinary authority. I believe the standard of morality to be pretty uniform—not higher even in the fields and lanes and cottages of country life than in the shops and streets of cities; and the dealer—I mean, of course, the honest dealer—who fills his cans amidst green fields, will have no better chance (though a very good one no doubt he will have) of supplying you with undiluted milk than the man who takes his milk from London cowhouses. In every case, too, whether that of a company or of a town or country dealer, you are dependent (often, no doubt, safely dependent) on the honesty of the servant who distributes it. But Dr. Whitmore tells me that his analyses have proved that milk purchased casually in the shop, and milk delivered by the carrier at the door of the consumer from the very same shop, are often very different things. A dishonest carrier has the chance, if he chooses, of supplying milk to a dishonest retail dealer, and filling up his can with water. Adulteration can only be prevented by the establishment of analytic supervision—a scientific agency constantly employed in comparing the composition of the milk offered in the shops with that of the milk drawn from the cow. An agency of the kind would, doubtless, be a very efficient and useful department of police, and there seems no reason why quality should not be tested constantly in this way by comparison with the genuine article, seeing that quantity is being constantly determined by the official comparison of weights and measures with the proper standards.

Suppose, however, that absolute honesty were (as I believe the per centage of honesty on the great scale to be) a pretty constant quantity and generally prevalent; how then about country milk as compared with that of the London cowhouse? Why, even then I believe the latter is likely to be the better of the two. First, it is more the interest of the cowkeeper here to feed his stock well than it would be the interest of the cowkeeper there; the latter has conveniences for calving his cows and keeping them on; the former must sell his cows as they get dry to the butcher. Secondly, milk brought 50 or 60 miles, as very much now is, to London, must be at least 12 hours old before it reaches the consumer; that from the London cowhouse is about four hours old, or barely so much. Thirdly, the shaking of the milk along the course of 50 or 60 miles of railway and the rattling over the roads to and from the station is certain in a proportion of instances to injure the milk, in other cases utterly to spoil it—in all, I may say, so far to injure it that it will not keep so long nor be so useful for certain purposes. That is the presumptive case against the country

milk as compared with that produced in London. What is the fact? If you want to know the real value of one or the other you must find out, not what the consumers of it give, but what dealers in it can afford to give who supply the shops—that unquestionably is the true measure of its value. Dealers in milk will give from 4d. to 6d. per barn gallon more for town-shed milk than for what is delivered by the railways. And no wonder, for even now it often comes in sour, and what must it be in the hot weather of summer? It is with very great regret indeed that the retail dealer finds himself cut off from his supply of town-shed milk, and forced to betake himself to the dealer from the country. London milk in London is worth more by a ½d. to ¾d. a quart than country milk in London. And that is a difference which would of itself be quite enough to account for the fact that bulky grass and mangels are carried many miles to London cow-houses, there to be consumed instead of being consumed by cows at home, even though there were not the great advantages which the London cow-keeper has in the close neighbourhood of the great breweries with their enormous supplies of grains.

But whatever the superiority of the town-shed milk, it is plain from the way in which the cowhouses have been emptied by the plague, that London will hereafter be fed from the country more generally than it has been. What is the quantity which has been hitherto consumed in town? I have here the published returns from the metropolitan association of medical officers of health of the number of cowsheds and of cows, so far as could be ascertained by inspection and inquiry, on the 13th of August last. Four districts out of 44 sent no returns, but adding a proportionate number for them, it appears that the number usually kept in the metropolitan districts amounted to 18,000, and very probably from outlying parishes sending milk up by cart and not by railway, there may be several thousands more. I may, therefore, probably assume that London has been hitherto supplied by 24,000 cows, besides what it has got by railway.

I have to thank the managers of the several metropolitan railways for the material of the following table, from which I see that the Great Western Railway has sent very little up till latterly; that the North-Western has sent up 40,000, 60,000, and 100,000 gallons annually during the last three years; that the Great Northern has sent up 250,000 and 300,000 gallons in 1863-4; that the Great Eastern has sent up 600,000, 800,000, 900,000, and 1,000,000 gallons respectively in the last four years; that the South-Eastern has sent up 120,000 to 180,000 gallons; the Brighton about 50,000 gallons, and the South-Western about 400,000 gallons annually. Upwards of 2,000,000 gallons were thus brought up last year, and this must be added to the 24,000,000 gallons with which, exaggerating perhaps a little, we shall credit our 24,000 cows. We cannot, at any rate, make out more than 26,000,000 of gallons for the 3,000,000 of London population last year. This is rather more than 8 gallons a-head per annum; rather less than one-fifth part of a pint of milk a day apiece.

Gallons of Milk Annually Imported by Metropolitan Railways.

	1861.	1862.	1863.	1864.
Great Western	Very little until 1865.			
North-Western (at 16 galls. to the can)	43,217	64,560	65,280	85,616
Great Northern	..	..	258,870	209,396
Midland	None	..	..	..
Great Eastern	606,400	884,523	940,702	1,020,492
South-Eastern	114,567	122,483	134,669	186,092
Brighton and South Coast	312	9,038	18,406	54,004
London, Chatham, and Dover........	No return.			
South-Western	About 1,500 gallons a day =			400,000

Gallons of Milk Imported Monthly in 1865.

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.
Great Western ..	?	?	?	?	?	?	?	23,474	59,782	103,214
North-Western (16 galls. per can)........	14,168	13,024	12,752	10,242	6,624	6,656	8,480	23,152	76,160	120,952
Great Northern..	14,904	15,276	16,416	18,216	20,124	20,392	20,556	20,952	21,924	26,016
Great Eastern ..	76,818	76,846	74,783	84,452	69,891	68,212	82,525	70,095	101,212	112,890
South-Eastern ..	15,804	15,245	17,547	19,414	23,843	22,638	20,680	22,559	17,307	21,318
South-Western ..	3,760 gallons a day during the last three months.									
London, Brighton, and South Coast	At the rate of 84,000 gallons a year.									

The returns given in another table (next page), for which I have to thank the vestry clerks and inspectors of the several parishes within the metropolitan districts, show the way in which the number of licenses for town cow-houses is being reduced from year to year. The present number of cows has been told me in a very few instances only; but Mr. Jones, of the East of London Cowkeepers' Association, announces that of 4456 cows usually kept in his district, only 805 are now remaining. And though this is much beyond the average of other districts (for instance, in Chelsea there were 745 cows usually kept, 182 have been sold fat during the autumn, and not above 10 or a dozen have been killed by the plague, and 45 fresh cows have been brought in) yet I gather from an inspection of the returns, still imperfect, to the Privy Council office, that there is no reason to doubt that one-half of the London cows have disappeared, and we are probably now dependent on 10,000 instead of 24,000 cows in and around London.

Under these circumstances of course the railways have

Parish or District.	No. of Cowsheds.			No. of cows usually kept.	No. of cows kept now.
	1863.	1864.	1865.		
Fulham	...	...	65	550	530
Kensington	49	38	33	750	300
Paddington	...	...	...	273	209
Marylebone	69	70	56	1,314	202
Chelsea	...	...	30	745	500
St. George, Hanover-square	...	...	14	395	?
Westminster	...	...	21	431	?
St. James's	...	...	0	0	0
Strand	...	...	4	92	29
Holborn	21	19	18	398	43
Hampstead	...	...	22	483	?
St. Pancras	100	99	92	1,179	206
Islington	...	71	69	1,317	108
St. Martin's-in-the-Fields	...	...	0	0	0
City of London	...	...	17	248	156
St. Luke's	...	...	?	...	...
Clerkenwell	...	38	29	650	100
St. Giles and St. George	...	...	9	170	nearly empty
Shoreditch	51	49	50	629	395
Hackney	...	88	88	1,288	450
Bethnal-green	...	0	40	463	277
Limehouse	...	...	23	188	71
Whitechapel	...	37	34	522	?
Mile-end Old-town	34	38	29	560	?
St. George's East	16	18	18	200	88
Poplar Union, North District; Bow	...	...	11	200	?
Poplar, All Saints	45	48	47	290	230
Wandsworth	...	...	26	112	?
Putney and Roehampton	...	...	9	30	?
Clapham	...	...	25	..	?
Lambeth	...	...	104	980	?
Camberwell	...	...	59	555	?
Streatham, Tooting, and Balham	...	...	19	121	?
St. John and St. Olave	...	3	2	38	9
St. George the Martyr, Southwark	...	...	...	207	?
Bermondsey	...	...	24	300	119
Lewisham	17	19	12	?	?
Lee and Kidbroke	...	...	10	235	?
Eltham	...	...	21	309	?
Newington, S.	...	...	34	402	?
Charlton	...	...	?	...	?
Plumstead	...	...	42	168	?
Greenwich	57	51	46	700	?
Rotherhithe	...	...	4	25	?

been brought into more active use, and they certainly now must lay themselves out more systematically h an hitherto for the conveyance of milk. Special trains, will, perhaps, be appointed, and special carriages constructed to enable its prompter and more safe conveyance. The table shows that the Great Western Railway, formerly carrying little milk, brought in 23,000, 39,000, and 103,000 gallons in August, September, and October (much of it from Wiltshire); the London and North-Western Railway in four successive autumn months imported 6,000, 17,000, 57,000 and 92,000 gallons; the Great Eastern rose from 70,000 to 100,000, and at length 112,000 gallons monthly, the South-Western rose from 1,500 gallons to 3,700 gallons a day, and other railways in some what similar proportion, so that London was supplied in October last with country milk at the rate of 5,000,000 gallons annually, which, however, was still a very inadequate return for the milk of 14,000 cows, which we have lost.

The Consumption of Milk.

I shall now state, as shortly as possible, such facts as I have gathered on the consumption of milk. Fourteen schools and asylums for children, containing 5,321 between two and sixteen, with about 500 adults to take care of them, consume, as I have been kindly informed by the managers of them, as nearly as possible 1,650 quarts a-day. Two adult asylums, not infirmaries, nor gaols, nor workhouses, containing 2,350 adults, men and women of all ages, consume only 350 quarts. I believe a company of 5,320 children, up to 16 years of age, need about 9,000 adults of all ages to be added to them, in order to make a community of all ages in the proportionate number which such ages represent in every general population. Adding, therefore, to the consumption of these that of 9,000 adults, according to the quantity of the two instances already specified, and you have a total of about 2,400 quarts drunk daily by 11,320 people, which is as nearly as possible (·42 pint), 2-5ths of a pint a-day a-piece consumed by a large general population under medical direction. It is plain, then, that London, which under the very liberal estimate already made does not get one half of this quantity a-head, is very imperfectly fed with milk.

Daily Consumption of Milk in Institutions.

Institutions.	Average age of children.	Children.	Adults.	Daily milk.
Asylums:—	Years.	No.	No.	quarts.
1	2 to 18	1150	60	173
2	11½	471	?	128
3	3 to 12	420	100	240
4	4 to 15	545	70	280
5	3 to 14	300	30	188
6	7 to 14	330	?	108
7	2 to 14	210	?	56
8	9 to 14	291	31	40
9	7 to 16	147	?	40
10	?	160	15	74
11	7 to 15	120	?	45
Schools:—				
12	11 to 15	757	?	94
13	?	170	15	55
14	14	250	?	127 (skim)
Adult Institutions:—				
15	...	...	2250	300
16	...	...	300	50
		5321	2871	2004
Add adults (estimated) in attendance on asylums and not specified above			229	
			3100	

What do other places get? Stirling, in Scotland, has a population of 12,500 persons, and is supplied by 190 cows in the town, besides 200 gallons a-day of buttermilk (a most nutritive and useful food) brought in by rail and otherwise. We have here a cow to every 60 people; and this, at the average of 800 gallons yearly to every cow in milk (less than I have put the produce of a London cow, because there is not so frequent a change among them) gives 100 imperial pints per annum to every man, woman, and child, or about 2-7ths of a pint a-day a-piece, very nearly the medical standard, and indeed exceeding it when the 200 gallons a-day of buttermilk are taken into account, for this would furnish half a pint a-day to the 3,200 belonging to the labouring class in a community of 12,000. I have to thank Mr. David Morton, of Stirling, for the above facts.

Take now Mansfield, in Nottinghamshire. There are here about 10,000 people, and 108 cows, one to every 93 people, just midway between Stirling and London. Taking these at 800 gallons a head per annum, and adding 20 gallons of skim milk daily, of which I hear as being sold in the outskirts of the town, we have only nine gallons (72 pints a head) per annum, or 1-5th of a pint a day apiece—one half the medical standard.

And this result corresponds to the ascertained consumption of seven working men and their families in Mansfield. These included 31 souls, and their consumption per week cost altogether 4s., just 1d. a day to each family, for which they would get 1-10th of a gallon. Five gallons a week for 31 people, or 40 pints for 217 days of one person, is less than one-fifth of a pint a day. I have to thank Mr. Henry Wilson, of Sherwood, for these facts.

Take, now, Bedford. It contains at present about 15,000 people, and there are exactly 100 cows in the town, and 123 gallons of milk, the produce of about 50 other cows are brought in daily by railway. One hundred and fifty cows to 15,000 people are one cow to 100 people, about the same as at Mansfield; and this, at 800 gallons a cow, is about 70 pints a year, or one-fifth of a pint a year apiece—one-half the medical standard. I have to thank Messrs. Howard, of Bedford, for the above statistics.

All these instances exceed the London standard of supply, though the two last are not so much beyond the metropolitan supply. It is plain, however, from these figures, that London is imperfectly supplied, and that I have still to justify the belief I have expressed that it is as well fed as many south country villages. Single instances will hardly prove this, or I could say that in my own village there are labourers' families with many small children who hardly ever taste milk after they are weaned. And I have seen the year's accounts of an Essex labourer who received the prize of £5 offered for many years by Mr. Wood, of Rochford, for the best year's cash book, kept by an agricultural labourer. His family with five children spent 6s. 2d. on milk in 1863, representing probably 150 pints of skim milk—or three-sevenths of a pint—not of whole milk for one, but of skim milk for seven daily. But the thing cannot be proved by individual cases. Let us, therefore, take the result of Dr. Edward Smith's inquiry for Government into the diet of the poorer classes of the country. He found that the weekly consumption of milk in the families of agricultural labourers (and he examined into from 10 to 30 cases in each county chosen with a special view to fairness) was 12 pints in Devonshire, 2½ pints in Somerset, 3 in Dorset, 3¼ in Wilts, 3 or 4 pints in Bucks, Herts, Cambridgeshire, 1-3d of a pint in Surrey, 1-5th of a pint (9 families examined) in Gloucestershire. Of course I am choosing the lowest examples on his list, but they are all examples of whole counties. Now, these numbers have to be divided by 5 (the average number of the family), and by 7, the days of the week, before you can ascertain the quantity consumed by each individual daily.

I find that in a poor court in the Strand there are 57 families, 294 souls living in 13 houses, and their daily consumption of milk is less than 4s. in all, for which they get 9 quarts or thereabouts. This is $\frac{1}{16}$th part of a pint a piece, and there was among them a baby brought up by hand, which had one pint a day to its own share, which still further reduced the general proportion. The milk for the baby, I may add, cost 2½d. in the shop, or 3d. if had direct from the cow. This is very little indeed, but there was an unusual number of adults in the company, only 40 children out of 294; and I will engage to find within two miles of my house at Streatley households numbering 294 in all, with double this number of children among them, who don't spend 4s. a day on milk nor anything like it, and who have not the chance of buying milk even at 3d. a pint from the cow if they wished it.

Looking at the quantity consumed by agricultural labourers in some of the southern counties, in Gloucestershire, for example, which may be called a land flowing with milk, I think I am right in saying that London, badly off as it is, is yet as well supplied as many south-country villages. Of course, however, it will not do to compare the quantity consumed in London with that which is used in Westmoreland, Northumberland and Scotland. Dr. Smith returns them there at 24 to 30 pints per family each week, or nearly a pint a day apiece.

In Berwickshire and many lowland counties it is almost universal for the farm labourers with families to keep cows and drink the whole of their skim-milk themselves; and where will you find better proof than in the labouring population of Scotland and the North of England, of the truth of words which I venture to quote from a letter of Mr. Chadwick to myself:—

"I can state as my general conclusion, from all my observation and information in respect to populations, that a cheap and abundant supply of fresh and good milk is of more importance for their health and strength than an abundant supply of meat. The foundation of the adult is laid in childhood and youth. Now our strongest and best labourers are from milk and oatmeal fed, or milk and bread, and milk and potatoe-fed children, as also from milk and oatmeal men with little or no meat. The strongest navvies are from the hill districts of Lancashire, our strongest labourers from Cumberland and Westmorland, and from the hill districts of Scotland, Aberdeenshire in particular. These have been the favourite recruiting grounds for guardsmen and soldiers of the greatest size and strength."

I add here that I am told the Northumberland militia regiment, recruited from the milk-fed agricultural population of that county, covers, or used to, more ground than any other county regiment in the service.

But I must not forget that my subject is London milk. If the facts I have collected shall do nothing more than clear away prejudice and exaggeration from the minds of its consumers, the labour of gathering them will not have been useless; but I hope that they may have some influence on the trade; that the public attention being directed to the enormous increase in the railway carriage of it, some improvement in the facility and safety of that traffic may be effected; and, above all, that attention being directed to the very deficient supply of milk to London, some increased spur to enterprise in milk production may ensue.

One word more: On Tuesday of last week I had been all day over Clerkenwell, Bethnal Green, and Mile-end Old Town, along with the inspector, through some 10 or 12 cowhouses, and it was almost dark when we reached the last upon our list. I there saw what I had not seen all day before, a full cowhouse—70 or 80 first-rate Shorthorn cows, well and comfortably housed, lighted up with gas, and being fed and cleaned up for the night—the master busy working with his men. I said to him—"You seem all alive here. I have not seen a full cowhouse to day before; have you had no plague here?" He told me that he had had 40 stricken and killed by it; but the other 40 had been in the pastures, and so were saved. I said, "But there are more than 40 here. You have shown great pluck in bringing your 40 home and buying others." He said—"We grubbed up the floor, double lime-washed walls and mangers, and spread 2 inches of hot lime over everything, and waited a couple of months; and I believe, therefore, we are safe." "They tell me I am mad," he added; "but it is a madness I take great delight in, and as long as I have money to buy a cow and a place to tie her up in, I'll have her." "Well," I said, "at all events you are making a pretty penny now with mangels cheap and grains for the asking, and milk at 5d. a quart." He gave me, I suppose, banter for my banter, for we all know that pure milk is to be bought wholesale for 3½d. to 4d. a quart, and retail in most places for 1d. more. "5d. a quart," he said, "I won't sell fresh milk to you or any other man for less than 6d.; but you can get a quart of *something* in the shop there for 3d. if you like." Now if any gentleman here is disposed to cry "name!" I must refuse to give the name, for I have not aimed at personality at all in the course of this statement, and have only named one or two where especial credit was due; but if the inspector who was with me then be present now, he will remember the conversation, and also the laugh which followed his own assent to the nature of this "something." "Yes," he said, "blue *ruin*."—I tell this story, for it represents a very large portion of my case. London milk, as in this instance, so *generally*, comes from the very best cows in the world, both for milk and flesh—from the best fed cows in the world, taking all the year round—and taking the average experience, for the most part from the most comfortably housed cows in the world—comparing them with 24,000 anywhere else, and all the year round. I will also say that it comes from the hands of some of the most hearty and energetic men in the world, for the London cowkeepers, especially, of course, those in large business, want neither energy nor intelligence. And seeing that country milk, whether better or not in fields, is not so good at the railway terminus, I add that London milk is originally the best milk in the world for Londoners; but it is very generally *spoiled* between the milk-pail and the tea-cup—so that when it

reaches the consumer, it is often little better than what Mr. Inspector called it—a mere *ruin*.

DISCUSSION.

Mr. Wentworth L. Scott said this was a subject to which he had paid great attention in and out of the laboratory, and although he agreed generally with Mr. Morton's arguments he differed from some of the deductions therefrom. The results of the analyses published in Mr. Morton's tables hardly supported the views given in his paper. He granted that there were, in many instances, very beautiful cowhouses in London, and good arrangements for the production of milk, and they had in the London market the means of procuring the finest animals; but, as the result of his experience during eight or nine years, he believed really good dairy accommodation was the exception and not the rule over the broad area of London. There was one drawback, as he regarded it, which could not be got over—that was the impure air. They might give the animals good food, but they could not get rid of the extreme amount of ammonia, sulphurous acid, bi-sulphide of carbon, and other impurities of the atmosphere which had a tendency to produce diseases in all kinds of cattle. From the way in which the food of the animals was stored, in the majority of cases, it was liable to absorb all these noxious gases before it was served out to them. For the purpose of comparison, he had prepared a series of analyses which represented the milk production of four counties in England, showing what he considered a really good class of milk to be.

Cow's Milk (Standard).

	1	2	3	4	5
Water	85·75	86·75	88·10	84·81	84·50
Mineral matter	·78	·79	·67	·74	·77
Butter	3·62	3·55	2·99	3·86	4·31
Lactine	5·05	4·62	4·44	5·12	5·67
Caseine	4·80	4·29	3·80	5·47	4·75
Total	100·00	100·00	100·00	100·00	100·00
Solid matter	14·25	13·25	11·90	15·19	15·50

	6	7	8	9	10
Water	89·02	85·40	86·04	87·05	86·12
Mineral matter	·69	·75	·77	·72	·75
Butter	2·85	3·85	3·06	3·11	3·87
Lactine	4·18	4·90	5·08	5·19	4·72
Caseine	3·26	5·10	5·55	3·93	4·52
Total	100·00	100·00	100·00	100·00	100·00
Solid matter	10·98	14·60	14·96	12·95	13·88

Dr. Whitmore remarked that when they considered the great importance of milk as an article of food, more especially to the juvenile portion of the population, and when they also remembered that the animals which produced this important article of food were now subjected to a very devastating disease, they could not overestimate the importance of the paper with which Mr. Morton had favoured them. In the discharge of his duties as medical officer of the large district of Marylebone, he had felt it his duty to inquire closely into the quality of the milk supplied to the inhabitants of that district. There was no doubt that the "cow with the iron tail" was largely in requisition in the production of London milk, which was very much diluted. Still, although this was so, he had not, upon the whole, found that London milk was inferior to country milk as regarded its nutritive constituents; but he was induced, as the result of his investigations, to come to an opposite conclusion. As a rule London milk contained a larger proportion of cream, more caseine, or cheesy matter, and more sugar than country milk. In order that he might be quite correct in his results he had recently conducted a large number of experiments on milk from cows which he knew to have been fed in the country, as well as from some fed in town, and he found that although for the most part the food they ate was of the same description, yet the London milk contained from two to three per cent. more cream than that from the country, and a great deal more caseine. The preceding speaker inferred that the food of London cows underwent a certain amount of decomposition by deleterious gases. He (Dr. Whitmore) thought that was a mistake. The best quality of hay and root food was supplied to them; and though in some cases distillers' wash and sour grains were given, that was the exception, not the rule. Another important article supplied to cows was water. In the country, where cows were kept out of doors, their supply of water was obtained from ditches or streams, the water of which contained a considerable amount of organic matter, while, as a rule, the London cows drank the water supplied by the water companies, which was much purer. With regard to the effect of London cow-sheds on the health of the population, he agreed with Mr. Morton to this extent—that when they were in really open situations they were not injurious; but when they were placed—as they often were—in confined localities without full opportunity for free ventilation—and generally these were the most dirty—he had reason to know that the health of the inhabitants did suffer. He was satisfied if they were obliged to go 100 miles away for milk, they would have it, as stated in the paper, unfit for use. The shaking during the journey produced a breaking up of the oil globules, and injured the milk. His experience led him to pronounce in favour of open, well ventilated sheds, in the neighbourhood of London, for the supply of milk to the metropolis.

Dr. Voelcker said there was one remark which fell from Mr. Morton which he could thoroughly endorse, viz., that London milk, when undiluted, was better than country milk, and especially richer in butter. He ascribed this to the fact that London cowkeepers for the most part fed their animals with better food—especially rich in fatty matters. He was, however, bound to say that London milk as generally sold to the consumer was not what it ought to be, but on an average was mixed with about 30 per cent of water (there was no other adulteration); and that a portion of the cream was taken off, was an equally undoubted fact. He could not take so favourable a view of London milk as Dr. Whitmore. That gentleman's own statement, he thought, proved what he (Dr. Voelcker) asserted—that there was generally a large amount of dilution. Where there was this considerable admixture of water, the specific gravity of the milk was invariably low. He maintained that milk which had a specific gravity below 1·026 was not genuine. He had carried out a great number of experiments purposely with the object of finding out an easy test of the general qualities of milk without having recourse to actual analysis, and he had come to the conclusion that the specific gravity test, in addition to ascertaining the quantity of cream that would rise, was an excellent method of ascertaining in a rough way what the quality of milk really was. He invariably found the richer the milk was in cream, the higher was its specific gravity. Some of his analyses, not embodied in Mr. Morton's paper, showed this. He therefore strongly recommended the managers of large public institutions, such as workhouses, lunatic asylums, &c., to apply the simple test of specific gravity. It was true skim-milk had a high specific gravity, but the mixture of water with it was apparent from the sky-blue tinge. When milk showed a specific gravity of 1·028 to 1·030 it might be relied upon as being genuine. He was anxious to make this statement as founded on a great number of his own analyses, and because the opposite opinion had been circulated in Dr. Whitmore's report—that the specific gravity test could not be relied on in respect to the genuine character of milk.

Dr. Whitmore observed that in the *Lancet* commis-

sioners' report, milk was considered to be genuine which had a specific gravity of 1·021 to 1·022.

Mr. Webber remarked that there was one feature of the case which had not as yet been presented to the notice of the meeting. Since the outbreak of the cattle disease a clamour had been raised for more milk from the country; but it was to be recollected that to the extent to which milk was taken away from a county like Wiltshire, so much cheese was proportionately lost. The milk was never wasted. In the Aylesbury district the milk was turned into the best quality of butter; and of course if it were sent to London this could not be produced. He saw no reason why, under a proper licensing system for cow-houses, an adequate supply of this important article should not be obtained from London itself and its environs. He regretted that the investigation of this subject had shown the existence of so much demoralization in the milk trade generally; at the same time, even in the form in which they got it, it was a very useful article of food, and it was highly desirable to increase its quantity, but he thought this should be done by other means than depriving the country districts unduly of a commodity which was reproduced in other valuable forms of food.

Dr. Druitt expressed his gratification at hearing a subject of this practical nature treated in the dispassionate, able, and truthful manner in which it was treated by Mr. Morton. As the medical officer of St. George's, Hanover-square, he had frequently gone into the subject of the adulteration of milk, and had as often given it up in despair of accomplishing any good. His analyses had been very numerous, and were practised on specimens bought in small quantities at retail shops. It was impossible, with a specific gravity as low as 1·017, to expect to find much cream in the milk. He agreed with the last speaker that the specific gravity test was perhaps the simplest, the readiest, and the cheapest, to which he also thought should be added the quantity of cream the milk afforded. Then there was a third test—that of the sense of taste and smell, which would go a great way in detecting the presence of water in milk, as well as in wine and beer. It was important that a good supply of pure milk should be provided, more especially when we remembered the large number of infants who were dependent on that article for their sole food. The returns of the Registrar-General exhibited a fearful table of infant mortality, and the various causes of death assigned might be summed up as simply meaning starvation. This resulted, to a great extent, from the milk with which they were fed having been deprived of its nutritive elements, only the thick curd remaining, which the delicate stomach of a child could not digest, and which occasioned diarrhœa, atrophy, and the multitudinous diseases which told so terribly upon the infant portion of the population. Dr. Druitt expressed himself as favourable to the feeding of cows in close proximity to London, and submitted that by no persons could that business be better conducted than by those who had been all their lives engaged in it, and the price of milk having been considerably enhanced, the public had a right to demand that they should be supplied with an honest and good article.

The Chairman having suggested that it would be desirable to hear the views of London cowkeepers on the subject,

Mr. Drewell said he could entirely corroborate the statements with regard to the superior quality of London milk over that supplied from the country. He had cows in London, and also at a distance of five miles from the metropolis, and he could state that the milk he had from the longer distance was not so good in quality as that which was produced in London. The cows were fed in the same manner in both cases. The cause of this difference he could not explain, unless it arose from the injury to the milk in the transit. A great deal of the milk from long distances arrived in London in a very bad state, particularly in hot weather.

The Chairman inquired whether Mr. Drewell found any difference in the healthiness of the animals in town and country.

Mr. Drewell replied that he found no difference in that respect. He had been as unfortunate with his stock in the country as in London.

Mr. Dancocks could vouch for all that had been said with respect to London and country milk. He had been a dairyman for 30 years, and his experience had long led him to the conclusion that London milk was far superior to that from the country. The great thing to be feared was that the recent ravages of the cattle disease would lead to a great decrease in the supply of London milk, from keepers being disinclined to maintain their usual stock of cows, owing to the very serious losses which most of them had sustained. The only security which could be afforded was the establishment by the Government of a National Cattle Insurance, so that the sheds might be filled again with cows, and the supply of milk to London be restored. He had been very unfortunate with his own stock. The animals which Mr. Morton mentioned as having been inspected by him were all gone, and great inroads had been made by the disease upon the fresh stock he had bought. He was not surprised at the complaints which were made against the quality of the milk, looking at the price at which it was supplied. The cost of the cows was about 12s. per head per week, and the average yield of each was from nine to ten quarts per day. He considered, including all the expenses, milk cost the producer in London 3d. per quart, and threefarthings per quart must be added for retailing it; yet it was expected that the article should be sold to the consumer at 4d. per quart. He contended the price ought to be fivepence or sixpence per quart to give a fair remuneration to the produce. He was extremely glad to see such a meeting on this subject, and he felt personally obliged to Mr. Morton for the very able manner in which he had dealt with it.

Mr. Campbell (of Rugby) said they had heard a great deal this evening about the difference between London and country milk, and all the speakers hitherto had expressed an opinion that country milk was decidedly inferior to that produced in London; but they had no facts or figures in support of that proposition. One speaker had said he was at a loss to account for the difference between the milk given five or six miles from London and that produced in London, unless it arose from the shaking of the milk in its carriage to town. It occurred to him that if cows were properly fed and attended to in the country, there was no practical reason why there should be any difference between London and country milk, except that it might perhaps arise from the want of proper mechanical arrangements for the transit. It was possible there was something in the present mode of transmission which affected the quality of the milk when it reached London. He thought some mechanical arrangements could be invented for carriage, which would enable the country to supply milk of good quality to the metropolis. He could corroborate generally the statement of Mr. Morton as to the consumption of milk in towns. At Rugby, with a population of under 9,000, the number of cows kept was equal to something like one cow to every 70 of the population—very similar to what was the case in London. The fact was the people of the south did not think so much of milk as the people of the north. In Scotland it was regarded as a positive necessary of life, whereas in the south people thought more of beer than of milk.

Mr. G. M. Allender rose to support the superiority of country milk over that of London. He believed, moreover, that the test of specific gravity was entirely fallacious, inasmuch as weight could be obtained by spurious means. One reason why the London dealers preferred London-grown milk to that brought from the country probably was that in the transit by railway the milk was so much shaken and churned, that they

could not afterwards skim it, and thus deprive it of its cream. Within the last few weeks he had carried out some experiments very carefully, under his personal observation, with the milk of one cow. By feeding the animal with the customary food used in Aylesbury she produced three and a-half gallons of milk per day; that was, running at grass with no other food than good hay. On putting the same animal upon London food—grains, Swedes, and cake—it was true that the yield of milk was increased from 3½ gallons to 5 gallons per day, but there was not one ounce more butter in the latter quantity than in the former, and the 3½ gallons yielded an equal quantity of nutritive constituents to the 5 gallons. That cow produced at the present price of milk 8s. 4d. per day, and he was keeping it for 11s. 6d. per week, which left him abont £2 profit, an amount which he thought a dairyman ought to be satisfied with. He thought London would be better supplied with milk from the country than from within itself, but the great difficulty at present was the transit of the article by railway; and when he stated the fact that from Aylesbury and an adjacent station, as much as 2,000 gallons of milk per day were sent, at a cost of about £3,000 per annum, and than ten such stations would yield a return of £30,000 a year to the railway company, he thought it would be to the interest of the company to supply proper appliances to convey the milk to London in an uninjured condition. For that purpose he suggested the employment of trucks with double roofs like the carriages in India and Egypt, so that the current of air passing through the double roof would keep the milk in a cool state, while a simple mechanical contrivance would prevent that shaking which so materially deteriorated the milk. He further suggested that the loads of milk sent up at night should remain in the trucks all night (especially in hot weather) in a siding four or five miles from London, and that they should be brought up to town specially at an early hour in the morning. By these means the quality of the milk would be best preserved. In his opinion the future supply to London would depend entirely upon the railways. They had heard the case of one enterprising cowkeeper who lost the whole of his stock and a great part of a second stock, and unless there was a cessation of the disease he felt pretty certain that cowkeeping in London would cease altogether, and their only supply would be from the country.

Mr. Jones stated that as an amateur dairyman he had on some occasions a great deal of milk thrown on his hands through being spoilt in keeping, and this led him to adopt the plan of cooling the milk down by placing it it in pans of water. Looking at the question in an agricultural point of view, it was true they could not get more bulk of produce off the soil than the average qualities of land would yield, but it was possible, by the use of materials from foreign countries—such as grain and oil-cake—to increase the produce of milk. This was done to a great extent by farmers in his own neighbourhood, and thus the materials from America and other countries went to increase the produce of the soil of England, and he thought that system was carried out as much in the country as it was in London. With regard to the alleged better quality of London milk, he would be glad to be informed in what sense the term "better" was taken? Did the superiority consist in the quality of the article or in the time it would keep good? because in the mind of the London dealer the milk which would keep the longest was best for his purposes, and he did not trouble himself either about the proportions of caseine or other constituents, or its specific gravity. If the country milk were treated in the same way as the London the probability was it would arrive in better condition; but if milk was put into the cans warm, and closed over so that the steam could not escape, the condensed vapour dropping into the milk would have a prejudicial effect in promoting decomposition.

Mr. Lundy (of Edinburgh) suggested a mechanical contrivance for the carriage of milk by railway, similar to that adopted for suspending the mariner's compass. In addition to the double-roofed truck, the cans might be placed in rows along the middle of the carriage, suspended on universal joints; and, if that were done so as to prevent the violent agitation of the milk, he believed the country milk would reach London in a condition that would leave no cause of complaint, and would be better than a good deal of the London milk at the present time. As a member of the Sanitary Committee of the Town Council of Edinburgh, he expressed himself very strongly against the system of feeding the milch stock of that locality on the coarse rank grass produced on the Craigentinny meadows by sewage irrigation. Yet it was the fact that those meadows were let to cowkeepers at the enormous rent of £40 per acre. One question which occurred to his mind was whether the physical condition of our milch stock had not been impaired by taking away the calves from their parent and bringing them up upon the "blue ruin," instead of allowing their frames to be developed by the rich aliment of the genuine milk. To remedy this, it might be a question whether it would not be desirable to import into the country foreign stock from the River Plate, and other parts of South America where they existed in herds in the wild state, and in undeteriorated physical condition.

The Chairman said the time had now arrived when it became his agreeable duty to propose a vote of cordial thanks to Mr. Morton for the exceedingly interesting and valuable paper he had read. If time had permitted he should have been glad to have entered a little into the discussion of this subject, but there was one point to which he would refer. The subject treated of in the paper was the supply of London with milk, and Mr. Morton had not taken up the sanitary considerations pertaining to the question; but in such a large population as existed in London he thought the sanitary question was one that ought not to be overlooked. He was sure he only expressed the feeling of the meeting when he said they tendered to Mr. Morton their best thanks for the exceedingly able, clear, and interesting paper which he had read.

The vote of thanks having been passed by acclamation,

Mr. Morton said he was much obliged for the compliment paid him. He would merely confirm the statement made by Mr. Lundy, that that rank grass produced by the Edinburgh sewage brought the enormous rent of £40 per acre for the production of milk. He thought this was a sufficient answer to the objections urged by that gentleman against feeding cows on that description of pasture.

Manufactures.

New Sugar Machine.—The *Bulletin Commercial* gives the following particulars of a vacuum machine, invented by MM. Cail et Cie., which has been used with success in Mauritius by M. Portal, owner of the Anse Jonchée estate. The apparatus consists of three vertical cylinders of copper, each containing two tubes half the internal height of the cylinders in which the steam circulates. The cylinders are six feet high and three feet in diameter, and are surrounded by a wood casing, which materially retards the loss of heat; they communicate with the outside by pipes. The first cylinder receives the waste steam which had hitherto been entirely lost, from the defecators and other machines used in the factory. The steam which rises from the boiling liquid in the first, warms the liquid contained in the second cylinder, and the steam from the second in its turn warms the third; a successive diminution of atmospheric pressure in each cylinder takes place, and this reduction allows an active ebullition to go on notwithstanding the diminution in heat. Two men suffice to look after the appa-

ratus, and if the vacuum-pan be conveniently placed, those who are occupied with it can also attend to the cylindrical generators. By this arrangement all the men employed in looking after the coppers, and the furnace which warms them, are rendered unnecessary, and the sugar is prepared at a temperature which renders the formation of molasses impossible. The quantity of crystallizable sugar given by the juice, thus becomes considerably greater, and at the same time its quality is said to be so superior that it hardly requires to be washed in the centrifugal machine. The simplicity of the apparatus is such that M. Portal finds that an ordinarily intelligent Indian can take charge of it after a few hours' training, and the only thing required for success is great cleanliness. It works with such rapidity that the cane-juice crystallizes in two to two and a half hours. The saving of fuel by this system is said to amount to one-third.

Commerce.

Beetroot Sugar.—Messrs. Arnold Baruchson and Co., of Douai and Liverpool, in their *Beetroot Circular*, express their belief that the present low price of beet, as compared with cane sugar, which they regard as an anomalous position of the trade, cannot last after the close of this year, because 70,000 tons of beet sugar having been purchased for Great Britain (supposing that the estimate of the crop, instead of 200,000 tons, be raised to 220,000 tons, and they feel inclined to believe that the yield will reach that figure), there would remain 150,000 tons, or only 4,000 tons more than last year's crop. Although a general monetary crisis and a sugar panic was raging at this period last year, still 21 to 32 francs was paid in November and December, 1864, for No 12., the present quotations being only 28 francs to 28 francs 50 cents. Whilst clayed Manilla and other low brown sugars are selling from 24s. to 25s. in England, and No. 12½ Mauritius was recently sold for an outport at 28s., strong grainy beet, in every respect equal, if not stronger and superior to Mauritius, can be laid down in England at 26s., whilst ordinary sorts may now be shipped at 23s. 6d. to 24s., f.o.b., according to quality and delivery; consequently, either cane sugar must decline in price, or an advance must take place in beet. The disproportion in value has already led many refiners in Great Britain, who hitherto have resisted its introduction into their houses, to purchase beet, and it is predicted that those refiners who still object to it will have to adopt its use or find themselves unable to compete. Those who are prejudiced against the use of beet argue, however, that the syrup is so much inferior as to reduce the value of the sugar—such was the case when only low brown syrups were imported into England. The sugars now shipped, from 12 to 14, besides containing a less quantity of molasses, are much purer, and free from objectionable flavour. The constant improvements in the process of manufacture are also in favour of the produce of beet. The quality of the present crop in France and Belgium, and also in Germany, continues to be very satisfactory. The probable total production for the year, from the more perfect information now possessed, is computed at 560,000 tons.

Colonies.

Sugar in Queensland.—The land now in cane crop embraces about 90 acres at Cleveland, and 70 acres at the Pumpama and Holkam rivers. The area of land to be put under cane crop this season will be regulated by the quantity of plants available for the purpose. Practical men who have inspected the crop at Cleveland predict a large and profitable return. The Colonial Treasurer was about to introduce a Bill to legalise the distillation of rum upon sugar-growing estates, which it is expected will secure the planters against possibility of loss upon the first year's crop.

City of Melbourne.—On 29th August last it was 30 years since the City of Melbourne was founded. On the 29th August, 1835, Mr. J. P. Faulkner, with five others, sailed up the Yarra in the *Enterprise* and landed on the site of the present city. According to a return, published recently by the Registrar-General, the estimated population of the colony of Victoria on the 30th June, was 616,663, viz., 354,229 males, and 262,434 females, showing an increase during the quarter of 3,206 males, and 2,564 females.

Publications Issued.

A Handy Book of Sanitary Law. By Martin Ware, jun., Esq., Barrister-at-law. (*Bell and Daldy.*) This work is published under the authority of the Society of Arts, and has been prepared for them by Mr. Ware, in consequence of a recommendation to that effect from the Society's Committee on the Dwellings for the Labouring Classes. In their report they remarked as follows:—"Whatever progress may be made in building or adapting houses by individuals or societies, the great mass of the labouring population, for many years to come, must necessarily live in very crowded neighbourhoods, in houses now existing, and not originally adapted to contain several families under one roof. It is therefore of the first importance that the owner of existing houses, inhabited by the poor, should be obliged to provide those sanitary appliances which are required for the preservation of the health of the tenants, and to check, when it occurs, the progress of infectious disease. Long experience has shown that nothing but constant inspection and compulsory measures will meet the carelessness and cupidity of the owners of this kind of property. The present sanitary laws are comprehensive, and, on the whole, efficient, although there are some particulars in which the Committee think they require amendment, especially with relation to the inspection of houses let to lodgers, but not now subject to the provisions of the Common Lodging Houses Act. The provisions of the Sanitary Acts are not, however, sufficiently known, nor do those who are qualified by intelligence and position to attend to the sanitary condition of their own neighbourhood interest themselves as much as could be desired in seeing that the powers of the law are put in execution." The Committee, therefore, recommended that the Council should prepare and publish a concise analysis of the existing law, hoping thereby to call the attention of the educated classes to this important subject, and to point out how they may, merely by a little attention and exertion, confer most important benefits upon a large mass of working people, and upon the country generally. The author expresses himself indebted for the assistance which Mr. Benjamin Shaw, an active member of the Committee, has given him in the preparation of the work. The matter is contained in forty-eight pages; and the book is sold for 6d.

Notes.

Captain Fowke's Funeral took place on Dec. 9, at Brompton Cemetery. Besides his family and relations there were present the following officers of the Royal Engineers—Major General Sandham and Major-General Matson, Col. Sir J. William Gordon, K.C.B., Col. Chapman, C.B., Col. Simmons, C.B., Col. Leach, Col. Hawkins, Col. Scott, Col. Harness, C.B., Col. the Hon. H. F. Keane, Col. Charles Gordon, C.B., Col. Collinson, and Col. Jervois, C.B.; Majors Ewart and Leahey; Capts. Martindale, Marsh, Sibourne, Charles Chesney, Du Cane, Decie, Andrew Clarke, Donnelly, and Festing;

Lieuts. R. O. Jones and Crawford. Also Messrs. H. Cole, C.B., Redgrave, R.A., S. Redgrave, Seymour Haden, Graham, J. C. Robinson, Rev. De La Mere, Sir W. Dilke M.P., Mr. Moffatt, M.P., Mr. Owen Jones, Mr. Digby Wyatt, Sir F. Sandford, M'Leod of M'Leod, Messrs. G. Godwin, Stephenson, Joseph Taylor, George Forrest, Thomas Lucas, P. C. Owen, A. S. Cole, G. C. T. Bartley, Snell, Liddell, C. Rowe Dillon, G. Redgrave, G. F. Duncombe, Sandham, Simkins, Townroe, Gamble, Eldon, and Douglas. Mr. Lowe, M.P., Mr. Godfrey Sykes, and many others were prevented from attending. The carriages of Lord Granville, Mr. T. Lucas, and other friends followed.

Carriage of Newspapers.—The London and North-Western Railway Company advertise that on and after 1st January, 1866, stamped newspaper labels, in sheets of 60, to cover the conveyance of newspapers, may be obtained at the company's offices in London, Birmingham, Liverpool, Manchester, Lancaster, Chester, and Shrewsbury. These stamps will be issued to frank the carriage of newspapers between any stations on this railway at the rate of one halfpenny for each single copy. This arrangement is not to interfere with the present rates for the conveyance of newspaper trade parcels.

Southampton School of Art.—The distribution of the local medals and other rewards, given by the Government Department of Art, to students of this school and of the schools in connection with it, recently took place at a public meeting held in the Hartley Hall, over which the Mayor (Mr. S. M. Emanuel) presided, Manockjee Cursetjee, Esq., judge of Bombay, distributing the prizes. The Mayor, in opening the meeting, introduced Mr. Manockjee Cursetjee as a gentleman who, casting aside the bigotry and superstition prevalent in his country a few years since, had come here and associated himself with us in order to study and the better to understand our national characteristics, and—what was still more—who had caused his two daughters to be educated in a manner before unknown to the people of their country. Mr. Manockjee Cursetjee said this was the first occasion on which a native of the far east had been invited to address a meeting and to distribute prizes to a school of art. He trusted, however, that this would not be the last occasion of the kind, but that similar honour would be paid to those who might hereafter travel in this country. He dwelt upon the advance made in art, especially decorative art, in the last thirty years. This he attributed to various causes, but especially to its recognition by Government and the establishment of schools of art. He spoke especially of the school at Southampton, and expressed his gratification at its success. A vote of thanks to Mr. Cursetjee, proposed by Dr. Joseph Bullar, and seconded by Mr. Falney, was carried unanimously.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...British Architects, 8.
Actuaries, 7. Mr. Marcus N. Adler, "Memoir of the late Benjamin Gompertz, F.R.S., with some account of his contributions to Actuarial Science."
Medical, 8. Mr. James Lane, "A Clinical Account of the Patients Treated by Inoculation by Dr. Roeck at the Lock Hospital."
Asiatic, 3.

Tues. ...Civil Engineers, 8. Annual General Meeting.
Statistical, 8. Dr. Farr, "The Mortality of Children in the different States of Europe."
Pathological, 8.
Anthropological, 8.

Wed. ...Society of Arts, 8. Mr. Owen Rowland, "On Parkesine: its Composition, Manufacture, and Uses."
Geological, 8.
London Inst., 7.
R. Society of Literature, 8½.

Thurs. ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Sir John Lubbock, "On the Metamorphoses of (*Chloeon*) Ephemera." 2. Mr. Butler, "On Amber."
Chemical, 8. Mr. J. Yates, "On the Material for Mural Standards of Length."
Philosophical Club, 6.

Patents.

From Commissioners of Patents Journal, December 8th.

Grants of Provisional Protection.

Animal substances, preserving—3009—T. Redwood.
Boots and shoes, lacing—3019—G. Moreton.
Boxes—3006—J. H. Johnson.
Carding engines, pointing the cards on—2876—R. Swires.
Casks—3061—G. Marshall.
Cork-cutting machines—3033—J. H. Johnson.
Embossing—3063—J. E. Brown.
Fabrics for dyeing, stretching and rolling—3059—H. A. Dufrené.
Fabrics, knitted—2718—T. Webb.
Fire, extinguishing—2854—J. C. Edington.
Fret-cutting machines—2896—W. Middleton.
Furnaces—3025—W. A. Lyttle.
Gun carriages—2976—T. B. Heathorn and J. H. G. Wells.
Hair dressing, &c., brushes for—2985—G. Smith and C. Ritchie.
Heat, raising—3029—J. F. Bennett.
High temperatures, registering—2780—F. H. Gossage.
Letter press and lithography, adapting cylinder printing machines to—2999—T. W. Nicholson.
Malt liquor, unfermented—3047—C. H. Newman.
Meat, preserving—2892—T. Redwood.
Nautical safety apparatus—3045—F. Mols.
Ordnance, mounting—3021—R. Mallet.
Oxygen—2934—J. T. A. Mallet.
Paper—3067—C. S. Baker.
Perishable substances, preserving—3043—W. R. Lake.
Photography, obtaining printing surfaces by—3053—A. V. Newton.
Pottery—3015—G. W. Turner.
Printed proofs, photography applied to obtain—2954—E. & J. Bullock.
Railway signals—2967—S. Hand and J. Slater.
Ships' parrels—3039—J. Manifold.
Springs, helical or spiral—3023—W. E. Newton.
Stays and bodices—3011—J. Ellis.
Steel castings—2970—G. Taylor and J. Fernie.
Steering indicators—2864—C. J. Viehoff and J. A. Matthiessen.
Submarine electric cables, laying of—2948—J. de la Haye.
Tea and coffee pots, handles of—3055—J. Thompson.
Thrashing machine—2888—T. Berrens.
Vessels, hulls and tackle of—3031—J. Ferrier.

Inventions with Complete Specifications Filed.

Hair, machinery for weaving—3066—G. T. Bousfield.
Shirt collars—3065—G. K. Snow.
Wells, sinking—3074—J. H. Johnson.

Patents Sealed.

1564. H. Hunt and R. Hunter.
1582. R. A. Brooman.
1588. G. Bonelli.
1590. R. A. Brooman.
1593. W. J. Hixon.
1602. T. Routledge and W. H. Richardson.
1628. M. Henry.
1768. W. E. Newton.
1790. A. V. Newton.
1818. G. T. Livesey.
1820. W. A. Lyttle.
1892. T. Swinburne.
1956. W. E. Newton.
2000. J. Pickin and R. Bailey.
2112. W. Clark.
2302. W. Cory and J. H. Adams.
2426. J. Davidson.
2494. I. Smith and W. F. Batho.
2516. J. W. M. Miller.
2648. J. de W. Brinckerhoff.

From Commissioners of Patents Journal, December 12th.

Patents Sealed.

1596. J. A. Millington and A. Allnutt.
1598. J. J. Bodmer.
1600. C. J. Collins.
1601. J. H. Johnson.
1607. B. and S. Massey.
1608. C. de Vandeuvre.
1613. S. Courtauld and C. W. Atkinson.
1614. H. Ormson.
1624. P. Lawrence and G. Jefferys.
1626. J. Hartley.
1627. W. E. Gedge.
1629. R. A. Brooman.
1630. R. A. Brooman.
1632. C. A. la Mont.
1633. W. T. Wanklyn.
1636. A. Klein.
1638. G. Payne.
1642. V. Baker.
1648. W. Clay.
1657. J. Parrish, C. Thatcher, and T. Glasscock.
1673. N. de Becker.
1703. C. Worssam and G. Evans.
1737. W. Schofield.
1749. J. Atkins.
1760. M. Benson.
1811. G. B. Woodruff.
1913. W. E. Newton.
1948. R. Mortimer.
2023. J. A. Leon, G. Tessimond, and J. Kissack.
2033. G. B. Woodruff.
2092. W. E. Newton.
2437. J. Donnell.
2509. J. A. Mee.

Patents on which the Stamp Duty of £50 has been Paid.

3316. J. King.
3260. T. G. Webb.
3262. L. Christoph, W. Hawksworth, & G. P. Harding.
3287. G. A. Huddart.
3300. G. Jeffries.
3348. G. Buchanan.
3279. R. E. Donovan.
3281. W. Palliser.
3354. J. Varley and J. Crowther.
3282. G. Lowry.
3313. D. Chalmers.
3392. S. C. Lister.

Patents on which the Stamp Duty of £100 has been paid.

2806. J. Ferrabee & F. H. England.
2838. W. Beardmore.
2794. R. A. Brooman.
2815. A. Lamb & W. A. Summers.
2848. W. E. Wiley.
2884. J. H. Selwyn.

Journal of the Society of Arts.

FRIDAY, DECEMBER 22, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

January 17.—"On Automatic Telegraphy." By Alexander Bain, Esq.

January 24.—"On the Uses of National Museums to Local Institutions." By Lord Henry G. Lennox, M.P.

Cantor Lectures.

The concluding Lectures of the Course by G. W. Hastings, Esq., LL.D., will be delivered as follows:—

Lecture III.—Monday, January 15th.—"On Copyright and Trade Marks."

Lecture IV.—Monday, January 22nd.—"On Limited Liability."

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing one Friend to each Lecture.

The tickets already issued will be available on these evenings.

International Horticultural Exhibition, 1866.

In connection with this undertaking, the Council have decided to offer a sum of £50 in prizes for Implements, &c., of which particulars will be found at page 86.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Sixth Ordinary Meeting.

Wednesday, December 20th, 1865; William Hawes, Esq., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Caunter, Henry, Stornoway, Isle of Lewis, N.B.
Dawson, G. J. Crosbie, C.E., Engineers' Office, Euston Station, N.W., and 7, Queen's-square, St. James's-park, S.W.
Emerson, William, 79, Hamilton-terrace, St. John's-wood, N.W.
Flux, Wm., 1, East India-avenue, Leadenhall-street, E.C.
Gardner, Hannibal, 19, Took's-court, Chancery-lane, E.C.
Garland, Charles, 28, Billiter-street, E.C.
Harvey, Richard Musgrave, 45, Portland-place, W.
Hughes, Walter, Southwood-house, Highgate, N.
Jones, Henry, 55, St. Paul's Churchyard, E.C.
Nutter, George, 167, Richmond-road, Hackney, N.E.
Parkes, Alexander, Warwick-place, Coventry-road, Birmingham.
Ravenscroft, Edward, 14, Preston-terrace, Edinburgh.
Spill, Daniel, Hackney-wick, N.E.
Towsey, William, 19, Bunhill-row, E.C.
Vaile, Samuel, 22, Basinghall-street, E.C.
Ware, Martin, jun., 25, Old-square, Lincoln's-inn, W.C.
Wilson, William, 4, Victoria-street, Westminster-abbey, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Ashbury, John, 27, Great George-street, Westminster, S.W.
Bikélas, D., 19, Old Broad-street, E.C.
Blackburn, James, Droylsden, Manchester.
Booth, J. P., Bellevue-house, Cork.
Cursetjee, Manackjee, Hill-house, Southampton.
Ellis, Edward, 9, Fenchurch-street, E.C.
Hindley, D. P., 10, Old Jewry-chambers, E.C.
Laycock, William E., Portobello-place, Sheffield.
Maxwell, Nicholas M., 4, Allhallows-chambers, Lombard-street, E.C.
Nash, Arthur Briscoe, 25, Cornhill, E.C.
Nixon, Joseph, 104, Fore-street, E.C.
Palmer, George Harry, 2, Middle Temple-lane, E.C.
Robinson, A. A., 137, Fenchurch-street, E.C.

The Paper read was—

ON THE PROPERTIES OF PARKESINE, AND ITS APPLICATION TO THE ARTS AND MANUFACTURES.

By Alex. Parkes, Esq., of Birmingham.

In introducing to this meeting the subject of Parkesine, the author wishes to explain the reasons that led him to the production of this substance.

For more than twenty years the author entertained the idea that a new material might be introduced into the arts and manufactures, and in fact was much required; he succeeded in producing a substance partaking in a large degree of the properties of ivory, tortoise-shell, horn, hard wood, india rubber, gutta percha, &c., and which will, he believes, to a considerable extent, replace such materials, being capable of being worked with the same facility as metals and wood. This material was first introduced, under the name of parkesine (so called after its inventor), in the Exhibition of 1862, in its rough state, and manufactured into a variety of articles in general use; it then excited the greatest attention, and received a prize medal, Class IV., 1112.

Parkesine is made from pyroxyline and oil, alone or in combination with other substances; the various degrees of hardness or flexibility are obtained in the easiest and most expeditious manner by varying the proportions of pyroxyline, oil, and other ingredients.

The pyroxyline used as the base in the manufacture can be made from any vegetable fibre, or fibre-producing grasses, starch, &c., but preferably of waste from cotton and flax mills, old rags, paper makers' half-stuff, or any fibrous waste material capable of being reduced into a soluble condition by the action of acids. To subdue the inflammable nature of this compound, the inventor has introduced several substances such as iodide of cadmium, tungstate of soda, gelatine, chloride of zinc, several carbonates, sulphates, phosphates, and other substances.

The oils employed are some of the vegetable and some of the animal kingdom; they may be used alone or combined, either in their normal condition, or changed by a solidifying agent, chloride of sulphur being preferred, which has the remarkable property of completely

solidifying the oils almost instantaneously; but the chemical combination can be modified according to the per-centages of the chloride of sulphur employed, which may be varied to meet the exigencies of commerce. These solidified oils, although unchanged by ordinary re-agents, are readily soluble in the author's solvents of pyroxyline, by which means the two ingredients are combined to form one of the descriptions of parkesine.

The inventor, after much research, labour, and investigation, observed that the solid residue left on the evaporation of the solvent of photographic collodion produced a hard, horny, elastic, and waterproof substance. This led him to employ, in all his experiments, pyroxyline, xylodin, or some collateral matter, as his base for future operations. By the word pyroxyline the author wishes to be understood a less explosive preparation than the more highly converted compound "gun cotton," and his constant aim has been to apply to peaceful industrial purposes a material hitherto only used for military, blasting, and photographic purposes. The solutions of collodion known at the time of his first patent, in October, 1855, were practically unsuited to carry out the manufacture in solid masses and other large forms. This necessitated a new series of experiments, to discover a more economical mode of production, and he found that, by improving the manufacture of pyroxyline, and using different solvents, considerable success was attained; as an illustration to show the impracticability of using collodion for the manufacture of solid articles, we have here a bottle of ordinary collodion, which is submitted to your notice. This is a solution of pyroxyline in the well-known solvents, ether and alcohol, and when you are told that, in one pint of these mixed solvents there is only one-third of an ounce of solid material, and the whole of this pint of solvents must be evaporated to obtain this small quantity of hard substance, you will readily conceive that the cost of production would be much too high for large commercial purposes. The cost of one pound of the mixed solvents would be 2s. 6d., the pyroxyline being 10s. per lb., and as one pound of pyroxyline will require 48 pounds of solvent to make photographic collodion, there will be a total cost of 130s. per lb. for the solid material which could be obtained from the evaporation of such solvents. This small specimen of pyroxyline now exhibited is the exact weight of that contained in the bottle, whereas, by employing the same quantity of the author's patented solvents, this large bulk of unconverted cotton, which, for the sake of safety, represents a similar bulk of pyroxyline, can be dissolved sufficiently for the manufacture of parkesine.

The author commenced his investigations in face of the above-named difficulties, and endeavoured, by more economical methods of manufacturing the pyroxyline or other similar compounds, and by the use of improved and less costly solvents, to produce a new and cheap material; this, after many years of labour and thousands of experimental trials, he has succeeded in doing, and at the present time almost any quantity may be made per day (many tons—simply depending upon the apparatus), at a cost of less than 1s. per lb. and upwards, according to the quality required.

The two specimens shown illustrate the great difference between the two productions. The small piece is made from the collodion of commerce, at a cost of 130s. per lb.; and the sheet is the result of that made from the present mode of manufacture, at a cost of less than 1s. per lb. This will at once establish in your minds the practical value of the invention.

Having then satisfied himself as to the possibility of producing the material at such a price as would allow of its application in the arts, his next step was, by the combination of various substances, to counteract the inflammability of the material—to produce various colours—and to modify its hardness, toughness, and elasticity; and although from the above statements the object sought to be obtained may appear exceedingly simple, it nevertheless necessitated an enormous amount of applicatio arrive at the knowledge which has enabled him to p duce the specimens which are now laid before you.

One of the greatest difficulties in the earlier stage of experiments was caused by the excessive contrac properties of the dissolved pyroxyline, as the piece produced, as compared with the comparatively la bottle, will clearly exemplify, being the whole of solid residue contained in thirty-five cubic inches collodion; in fact, if a stiff solution of pyroxyl were made, such as would not flow from a bottle, such a preparation would contract to from ten to fift times its volume, whilst in the present workings o from one-fourth to one-fifth of a pound of solvent used to one pound of pyroxyline; consequently contraction is reduced in proportion to the solve used.

The author had long to contend against the verse opinions of many, that his efforts to int duce such an article for the general purposes of ma facture, from such expensive materials, appeared hopele and even since specimens were shown at the Exhibiti of 1862 much discouragement has been thrown in way of the progress of the invention, by many w had conceived the idea that it would be impossi to produce the material at a price that would ren it valuable for general application; the inventor fe proud that he has been enabled to surmount th obstacles in so far establishing a new manufactu which—by the intelligence of practical minds, which trusts will be devoted to its further development—w he ventures to hope, eventually become one of consid able commercial importance.

The innumerable trials and investigations requir involved no less than twelve years' labour and an expe diture of many thousand pounds, before the material cou be proved to be really of commercial importanc and although this may appear a long time to purs one object, the author wishes to explain that ti has been itself of the utmost importance in developi this manufacture, as it has enabled him to test the effe of time on the material, and also of atmospheric chang and many other influences; this has proved of gr value in arriving at his present knowledge of t material. Although he has been much engaged in oth important business he was determined not to linquish the manufacture of parkesine until the truth what he stated at the Exhibition, in 1862—that t material could be produced in some of its qualiti at 1s. per lb., was proved—and this he has satisfactori established by twelve months' practical working. O of the means which enable him to produce parkesi at a cheap rate, is the employment of waste cotto in the shape of rags or otherwise, which are p curable at an exceedingly low price, and also the of improved solvents, and the means of recoveri them by special machinery; also the being able to d solve the pyroxyline in a wet state, thus avoiding t time and great space and risk of drying, which was t practice until recent important improvements enabl him to accomplish this most important desideratum.

When it is necessary or desirable to increase the fle bility or elasticity of preparations of pyroxyline, t author combines therewith oils, solidified or partly soli fied by the action of chloride of sulphur, a reaction di covered by him some twenty years ago, when engaged investigations relative to the cold process of vulcanizi India rubber, patented by him about that time. T chloride of sulphur is dissolved in bisulphide of carbon mineral naphtha, the proportion suitable for the purpo being from 10 to 15 per cent. of chloride of sulphu to the cotton seed, castor, or other oils. This will found (as will be exhibited to you by experiment) to of a solid or a semi-solid consistence, according as mo or less of the chloride of sulphur is used, so that t physical condition of preparations of pyroxyline may considerably modified to suit special applications by t

use of gums, resins, paraffin, stearine, tar, glycerine and other substances combined therewith.

The author would observe that the result of using a large proportion of the chloride of sulphur is to solidify the oil (even to a jet-like mass), but it is preferable to use about 15 per cent. to produce a tough, elastic substance. He wishes it to be observed, generally, that in proportion as the oils predominate, so is the elasticity of the materials regulated.

Another important improvement in the manufacture of parkesine is the employment of camphor, which exercises an advantageous influence on the dissolved pyroxyline, and renders it possible to make sheets, &c., with greater facility and more uniform texture, as it controls the contractile properties of the dissolved pyroxyline; camphor is used in varying proportions according to requirement, from 2 per cent. to 20 per cent. Another of the author's improvements for the like object consists in the use of gelatine dissolved in glacial acetic acid.

The author believes he was the first to employ colours in the dissolved pyroxyline. The solvents used in the manufacture of parkesine are also good solvents of the aniline colours; this gives the great advantage of producing the most beautiful colours in a transparent substance, as well as in opaque or solid masses, as the specimens will show; and when these coloured articles are carved the most exquisite effects are produced, imitating amber, malachite, and many other natural substances; moreover, as the material can be moulded by pressure, the most beautiful works of art can be copied at a very small cost. For many large and cheap applications, as much as 60 per cent. of pigments, saw-dust or cork-dust, can be introduced with advantage, and thus is produced a beautiful and solid substance, very strong, which can be moulded and turned in a lathe or rolled into sheets, the cost, owing to these admixtures, being exceedingly low.

In all large manufactures the most important point to be considered is the production of raw material, which in many cases fails in quality and supply. The substances the author employs in the manufacture of parkesine are procurable in any quantity, and having a perfect control in the manipulation of the materials used, he can always ensure a regularity in the various qualities required, thus placing at the command of the artisan a material to be had at all times of a uniform standard quality, which he conceives to be no slight boon to the manufacturer.

There is another important feature in the economy of this material; no loss in manufacture is experienced, every particle, scrap, or dust can be reworked, and the most beautiful effect produced. Specimens will show the effect of some of the waste scraps re-manufactured, and it will be readily seen that by careful admixture of colours very pleasing results may be obtained. This is an important advantage over other materials, such as ivory, tortoise-shell, india-rubber, vulcanite, gutta-percha, &c., with which this substance is calculated to compete.

The difficulties in manufacturing this material on a commercial scale were at first very great, as before explained, but by steadily persevering, the manufacture is now rendered very simple and rapid. From five to ten tons of parkesine sheets can now be produced in less time than one ton of India rubber. Sheets of large size and of any thickness, solid blocks, tubing, or other forms, can be made in a few minutes, and from the cheapness and unlimited supply of the raw materials employed, the price of parkesine will, it is believed, be much less than that of india-rubber, ebonite, gutta-percha, ivory, tortoise-shell, and many other materials.

Many specimens on the table have been produced from materials made ten years ago, in which no change or decomposition has taken place; the substance is not affected by sea-water, in which it has been immersed for a period of four years without the least deterioration, nor is it softened by heat-like gutta-percha, and, therefore, it is not likely to be affected by the heat of tropical climates.

It can be made transparent, or in any colours, variegated to imitate tortoiseshell, marble, malachite, hard or flexible; can be moulded, shaped, by dies or pressure, turned in a lathe, worked into screws, cut with a saw, planed, carved, engraved, rolled or pressed into sheets, as all the articles in the case before you will clearly show; it is very agreeable to the touch, and is susceptible of the highest polish; it can be inlaid with metals without any injurious effect upon them after years of exposure; it is also invaluable as a waterproofing agent, and can be used as a varnish for a variety of purposes, and as a non-oxidising agent for the protection of iron ships, &c.

The various stages of manufacture are fully illustrated by the variety of specimens now before you, from the unprepared cotton waste to the ultimate conversion into the finished articles.

Perhaps one of the most interesting facts in connection with this new manufacture is the employment of nitro-benzole, or aniline, by which improvement very great facilities are obtained in dissolving pyroxyline, and as these materials are also solvents of india rubber and gutta percha, a combination of these substances may be readily obtained which will be valuable for many purposes. A specimen of this combination is on the table.

The applications of this material to manufactures appear almost unlimited, for it will be available for spinners' rolls and bosses, for pressing rolls in dyeing and printing works, embossing rolls, knife handles, combs, brush backs, shoe soles, floor-cloth, whips, walking sticks, umbrella and parasol handles, buttons, brooches, buckles, pierced and inlaid work, book-binding, tubes, chemical taps and pipes, photographic baths, battery cells, philosophical instruments, waterproof fabrics, sheets, and other articles for surgical purposes, and for works of art in general.

There is one application of the parkesine which, as far as experiments have gone, promises to be of great importance, viz., insulating telegraph wires. It will be at once evident, from the nature of the ingredients used, that by simple mechanical and chemical processes, perfect freedom from impurities or foreign ingredients can be attained; a most important property in a material which it is intended to employ for electrical and insulating purposes. The difficulty of producing a pure and homogeneous article, has, there is reason to believe, resulted in the total failure of some thousands of miles of submarine cables and underground wires. Parkesine is placed upon the wire by being forced through a die in successive coatings with the same facility as gutta-percha, and the author believes it to be far less liable to faults than india-rubber.

A few specimens of the application of the material for electrical and telegraphic purposes are exhibited. It is, however, deemed advisable to state, that extensive experiments have been made under the direction of Mr. Owen Rowland (Electrician to the late Joint Committee of the Board of Trade and the Atlantic Telegraph Company, appointed to inquire into the construction of submarine telegraph cables, &c.), with a view of ascertaining to the fullest extent the electrical properties and applicability of the material for the above important purposes. The results of those experiments leave no reason to doubt that, on the completion of the necessary machinery, a most excellent and efficient insulator will be produced (and indeed it has already been produced, even by imperfect and inadequate machinery), possessing all the requirements of insulation.

Short specimens of insulated wire (made by hand) in this substance for underground and aerial lines are exhibited, the latter in the form of a multiple cable, according to the valuable patent of Professor Wheatstone, containing an insulated sustaining iron wire, and 79 insulated conducting copper wires, both insulation and protecting envelope being effected by

parkesine, which, possessing great strength and flexibility, and being a non-oxidising material, is extremely well adapted for the latter purpose. This cable is believed to be capable of bearing its own weight in air for a distance of upwards of one mile.

In its hard and solid form, by virtue of its high insulating and non-oxidising properties, this material is peculiarly well adapted for electrical instruments, terminal boards, testing boxes, batteries, insulators for poles, and many other philosophical purposes, and the advantages to be derived from the employment of a material which remains free from oxidation under all conditions, will be duly appreciated by electricians and experimentalists in their daily operations amd investigations. Its tensile strength is considerably above that of either gutta percha, india rubber, or any other insulating material. Joints can be made with the greatest facility and perfection.

In the following experiments on the insulating power of parkesine as compared with various other materials, the greatest care was taken to secure a correct and reliable result. The temperature was constantly maintained at 61°; the pieces were thoroughly dried, to avoid surface conduction; the same surface length of each made to rest on the metallic stand in contact with earth; the blotting paper between the *piece* and the metal kept saturated with water, so as to insure complete surface contact; the leakage of the instrument itself frequently ascertained; the full tension at the commencement of each test recorded as well as the exact time. The tests in some instances were repeated several times with uniform results.

Experiments made at Hackney Wick, on the 29th August, 1865, on the loss of insulation on lengths of variously coated copper wires, &c.; instrument employed, a Peltier electrometer. Full tension, 40; temperature, 61° Fahr.

Parkesine	5 deg. in	1'	45"
Plain gutta-percha	„	0	37
Gutta-percha and Chatterton's compound	„	1	8
Plain gutta-percha covered with parkesine	„	1	4
India-rubber (masticated)	„	1	15
India-rubber (virgin)	„	0	30
Ebonite disc	„	2	10
Parkesine disc	„	2	35

The author has been furnished by Mr. Owen Rowland with the result of a further series of experiments made recently by him on the insulating properties of the material. These tests were made upon slabs and sheets of various qualities, hardness, and flexibility. Specimens are exhibited.

The value of the insulating properties of each piece in comparison with ebonite is shown in the following table:—

	Leakage.		Time.	
No. 1 specimen ..	11.5 deg.	in	1,080	seconds.
„ 2 „	11.5 „	in	510	„
„ 3 „	11.5 „	in	180	„
„ 4 „	11.5 „	in	360	„
„ 5 „	11.5 „	in	210	„
„ 6 „	11.5 „	in	185	„
„ 7 „	11.5 „	in	212	„
„ 8 „	11.5 „	in	509	„
„ 9 „	11.5 „	in	25	„
„ 10 „	11.5 „	in	2,046	„
„ 11 {Prepared Oil or base of Parkesine}	11.5 „	in	1,930	„
„ 12 ebonite ..	11.5 „	in	1,050	„

The third column shows the time occupied by the needle of the electrometer in falling from the maximum tension of the electric charge to one-half tension thereof, or from 50 deg. to 38·5 deg.

It is satisfactorily proved that the more perfect th means adopted for rendering the material free fro impurities, the more its efficiency for insulating purpos increases.

DISCUSSION.

In reply to inquiries by Admiral Sir EDWAR BELCHER, it was stated by Mr. Parkes that the solve employed in this process was naphtha—either vegetab or mineral; that the present price of parkesine rang from 1s. per lb. upwards, according to quality; that i specific gravity was about equal to that of gutta perch that no experiments had yet been made with regard the resistance of this material to cannon.

Sir EDWARD BELCHER thought it was likely to be ve valuable for the filling in of the intervals between th plates and the backing in iron ships of war instead teak. He thought it would afford greater resistance shot, and there would be no splinters. He wished know whether it was inflammable.

Mr. PARKES replied that it could be made almost u inflammable; and moreover, when used in contact wi iron, it had no tendency to produce oxydation. Wi proper machinery a ton weight of the material would produced in half-an-hour. As a varnish [a specimen which was exhibited] it could readily be applied to th bottoms of iron ships to prevent corrosion from sea-wat Experiments were being carried on with regard to i imperviousness to the attacks of marine insects, but th results had not yet been ascertained.

Mr. OWEN ROWLAND said, having been for some tim engaged in making experiments upon this material, wi a view to its application to telegraphic purposes, thought it would be interesting to hear the results those experiments. He had watched with great inter the progress of this invention for the last three yea and, like all great inventions, it had had a great deal contend against, because it was very likely to displa many articles which were now very much in popul favour and use. He had kept several specimens various materials (this one amongst the number) expo to atmospheric influences, under different conditio during the time he was engaged on the part of the Bo of Trade in testing different insulating substances. found that atmospheric exposure had not the least eff upon this material. It was not rendered less elastic, and toughness was not diminished, nor was there the least proximation to decomposition. In that respect he belie it would be most valuable from its non-oxydizing properti In regard to its application to telegraphic purposes he sure they would all say they could not but wish to se material introduced which would extend the great adv tages which the telegraph was calculated to confer up society. There was room for many materials for th purpose, and he was sure telegraphy had suffe immensely from the doubts existing in men's minds a the sufficiency of the insulators now generally employ The battle of the insulators in telegraphy had rival that of the gauges in the earlier days of railroads. a considerable time past the efforts made to furnis new insulating material had been very great; from to day combinations were produced, which he had s mitted to the test of the particular form of electrom he had before him (Peltier's), which was unerring. results of his tests of the substance now un consideration led him to think that in material they would eventually have an excell cheap, and efficient insulator. On the paper placed the board at the back of the chair he had arran specimens of the material of different qualities, and had tested the insulating powers of each specimen. instrument employed in the testing was charged t tension of 50, representing 512 cells of Daniel's batt He placed this instrument in contact with the insula material, and then watched the fall of the needle. the needle fell so much in a minute with one article

fell more with another, then the former was the superior insulator. The results of these experiments were given in the table at the end of the paper. He did not agree with the plan of testing cables which had hitherto been pursued; he believed it had not been half severe enough. He had tested some hundreds of miles of the Atlantic cable, and he considered the test was not stringent enough. Sufficient attention had not been paid to the temperature and dryness of the atmosphere. In making his (Mr. Rowland's) experiments, the room in which the testing was to be carried on was kept at a temperature of 61 deg. to 65 deg., and the hygrometric state of the atmosphere carefully ascertained. The first attempt with material No. 9 (in the table) showed a leakage, that was, the needle of the instrument fell down 11·5 deg. in 25 seconds; with No. 3 it fell down the same amount in 180 seconds; with No. 2 in 510 seconds; with No. 1 in 1,060 seconds; with No. 8 in 509 seconds, and this was an excellent insulator; with No. 10 in 2,046 seconds, and so on with the rest, while ebonite took 1,050 seconds. Ebonite, which had been very much used, had been generally regarded as a very excellent article for these purposes, but he considered it had been surpassed by this invention. No proper machinery had as yet been constructed for the production of this article as it was intended to be ultimately manufactured. It required the utmost cleanliness and purity in its manipulation when intended for insulating purposes. Those were important considerations in all electrical matters, and having witnessed the manufacture of several telegraphic cables, he was pleased to see that this material, even though as yet imperfectly manufactured promised so well as an insulator. He remembered that in the first manufacture of gutta-percha considerable impurities existed, and in many cases a really good insulating material had been condemned entirely through the foreign matters which it contained. He had a very strong opinion of the durability of this material. He saw no change in it, in whatever conditions he had placed it. He had boiled it in water; had exposed it to a hot sun; and had tested it in conditions to which it would never be exposed when used for electrical purposes, and he found little or no effect produced upon it. What was required for the perfecting of the invention was machinery into which no impurities could enter. He was very glad to find this invention brought before the Society of Arts, as had been done in the case of some of the greatest inventions ever produced. Twenty-one years ago he assisted Mr. Fothergill Cooke in exhibiting an electric telegraph in this room, which on its first introduction to the world had a great deal to contend against. He confidently expected to see this new material taking its place in the great and important work of extending electric telegraphy.

Mr. Wilson inquired the means by which this material could be joined together?

Mr. Parkes replied it was joined by means of its own solvent, and became a homogeneous mass.

Mr. Benjamin Fothergill asked whether, in the event of this material being employed on iron for rollers, there was any danger of its becoming disunited from the iron?

Mr. Parkes replied, that from its elastic and cohesive property and contractile force he could not imagine that it would separate from the iron.

Mr. Taylor remarked that as the inductive capacity of materials employed in telegraphy was a point of great importance, he should be glad to hear whether this material exhibited any advantages in that respect.

Mr. Rowland replied that the figures he had given might be said to represent the inductive capacity of the material. He believed it to be about equal to india-rubber in that respect.

Dr. Bachhoffner said the variety of applications to which this material seemed to be adapted rendered it one of considerable interest and importance. As to its applicability to telegraphic purposes, practical trial alone could decide the question. The conclusions arrived at by Mr. Rowland, as the result of his experiments, were entitled to weight, but he believed it was a question whether that perfect insulation spoken of was the best condition for an electrical cable; however that might be, there could be no doubt that in this invention a very important addition had been made to our manufacturing resources, and he hoped his friend in the chair would not object to the inventor enjoying the benefits of a patent for it. It was always the privilege of an Englishman to grumble, and he claimed that privilege on the present occasion, inasmuch as having seen the announcement that "parkesine" was to be the subject of discussion this evening, he consulted every book in his possession in the endeavour to ascertain what parkesine was, but he failed in obtaining the information. He begged to raise his protest against inventions of this kind being called after the name of the inventor, for though, doubtless, this name would be handed down in connection with the material, yet, as there were a great number of Parkes's, many of that name might unjustly arrogate to themselves the merit of this invention. It was, however, often the case that great discoveries were associated with the patronymic of the inventor or discoverer, as in the cases of Galvani and Volta in connection with galvanic or voltaic electricity, and MacAdam, the inventor of the modern system of roads; but he thought, from the multiplicity of purposes to which this material was adopted, it would be well to give it a name which would convey a better idea of what it was than could be gained by the public generally under its present title.

The Chairman said it was now his pleasing duty to ask the meeting to thank Mr. Parkes for his paper, practically illustrated as it had been by the observations of Mr. Rowland. He should perhaps have objected somewhat to this paper in its present form being read, had he not known that it would be supported as it had been, as a matter of principle, by Mr. Rowland, whose views were entitled to so much weight. So far as his own individual opinion went, he thought it desirable that papers read before a Society like this should not have for their object merely the description of some particular invention, but should be more general in their character. No one, however, could question the importance of a discovery which introduced a material likely to be of great value in the arts and manufactures of the country, and the want of which was becoming more and more felt. We were exhausting the supplies of india rubber and gutta percha, the demand for which was unlimited, but the supply not so. In the case of gutta percha the tree was destroyed in taking the produce of it, and we had to wait till other trees grew for future supply; and with regard to india rubber, the plants only produced a limited quantity each year. This new commodity, however, was produced from materials of which there was an unlimited supply, and as such its application to the purposes of electric telegraphy would be a matter of the highest interest and importance. Here he would make an observation in reply to the joke on the subject of patents, made by his friend, Dr. Bachhoffner, who was an advocate of one principle, while he (the chairman) supported the contrary view. That gentleman had taken the opportunity of assuming that he (the chairman) could not object to the inventor of this material having patented it, and deriving benefit from that patent. Certainly he did not object to his being benefited by the result of his labours through the means of a patent; for so long as the patent laws existed they were open to all; and he himself, though he thought on the whole they were injurious to the country, would not hesitate to benefit by them so long as these laws remained in force. But the argument of Dr. Bachhoffner was in reality in his favour. He objected to the name of parkesine being applied to the material, because there might be many "Parkes's." That was in fact the great objection to the whole principle of the Patent Laws

In this country there was scarcely a process or invention, or a new application of science to the arts, that hundreds of persons were not engaged on at the same moment of time. It was only a question which would be first to go to the patent office and secure the benefits of that which was occupying the time of a hundred other persons, whose results would have appeared in due course if a patent had not been secured by one, who thus impeded the labours of the others. The result was to give a monopoly to one person in a matter which ought to be shared in by many. As the law now stood, it was not the man whose ability and scientific knowledge brought about a great invention who got the benefit of it, but it was the most active and energetic man of business, who, simply by being the first to secure the patent, derived all the advantages. It was clear, if they looked at the specimens on the table, that this material was applicable to a vast variety of uses, from a shoe-sole to articles of ornamental art, and he was sure the meeting would unanimously agree that Mr. Parkes was entitled to the thanks of the Society for the very interesting subject he had brought before them this evening.

The vote of thanks was then passed and duly acknowledged.

INTERNATIONAL HORTICULTURAL EXHIBITION AND BOTANICAL CONGRESS, 1866.

This exhibition and congress will take place in London (probably in the Garden of the Royal Horticultural Society, at South Kensington), and will be open four days, from May 22nd to May 25th, 1866. The leading botanists and horticulturists throughout Europe have been invited, and two morning meetings (of the nature of a congress) will be held, at which papers prepared by leading botanists or horticulturists will be read and discussion thereon invited.

There will be two conversazioni and a banquet, to which leading foreign visitors will be invited as guests, and to which also ladies subscribing will be admitted. (Tickets three guineas each.)

The committee will endeavour to arrange that the most easily accessible English gardens, in which some feature of British gardening—such as "forcing," "decorative gardening," &c.—is well illustrated, shall be open to foreign visitors.

A subscription list has been opened for obtaining the funds necessary to the formation of a liberal prize-list (the prizes offered amount to over £2,500), the erection or part erection of the necessary exhibition building, the entertainment of foreign visitors, and for the working expenses of the exhibition and congress; a guarantee fund has also been opened.

The prizes are to be alike open to competition amongst home and foreign cultivators. The objects exhibited in one class cannot compete in any other. Prices may be affixed to the plants and other objects exhibited.

Every exhibitor must be prepared to declare that the objects he exhibits are his own property, or that of his employer. Those persons who intend to take part in the exhibition must signify their intention to do so by letter, addressed to the exhibition secretary. Every exhibitor must specify exactly the classes in which he intends to compete, and the space (in square feet) his exhibitions will occupy. This must be done on printed forms, which will be sent on application, and must be returned on or before the 1st of May.

A sub-committee will undertake the duty of receiving all objects presented for exhibition, and of distributing them according to the degree of temperature they require. Tropical plants will be placed in a building suitably heated.

The executive committee will endeavour to make arrangements with the several railway and steamboat companies to convey all objects for the exhibition at a reduced rate, and all packages must be delivered carriage paid.

A jury of distinguished horticulturists will be constituted to judge the objects sent for competition, and will assemble on the morning of Tuesday, the 22nd of May. Its decisions will be absolute.

The rewards will consist of money prizes only. One prize only can be taken by one exhibitor in each class, except amongst new plants and seedlings.

The opening of the exhibition will take place at three o'clock in the afternoon of Tuesday, the 22nd of May, when subscribers' and guarantors' tickets only, besides those of such persons as may be specially invited, or furnished with guinea tickets, will be admitted. Subscribers and guarantors will have certain privileges depending on the amount of their subscriptions.

The schedule of prizes comprises (1) General Collections, in which prizes for no less than twenty-six classes of objects (three prizes for each, of various amounts) are offered; (2) "Collections representing Families;" (3) "Collections representing Genera;" (4) "Collections representing Species and Varieties;" (5) "Seedlings;" (6) "Fruit," which must be exhibited ripe and fit for use; (7) "Vegetables;" (8) "Bouquets and Objects of Ornament in Natural Flowers;" (9) "Implements, Designs, &c.;" and (10) "Extraordinary Prizes."

In Class IX. (Implements, &c.) the Council of the Society of Arts have decided to offer the sum of £50 in prizes as follows:—

1. Half-size model showing the best principle of construction for a tent, for horticultural exhibitions, capable of being extended by a multiplication of the parts exhibited......	£10	0	0
2. The best transplanting machine for weights of 8 tons and upwards	10	0	0
3. do. do. for half-ton weights	5	0	0
4. The best method of ventilating plant structures, to be shown by a model............	5	0	0
5. The best garden wheelbarrow in principle of construction	3	0	0
6. The best sun shade for garden seats	3	0	0
7. The best guard for protecting young trees from animals in parks, orchards, and pleasure grounds	3	0	0
8. The best instrument for working to levels and slopes in garden ground work	2	0	0
9. Earthenware boxes for edgings capable of producing any length of straight and curved lines for borders in conservatories	3	0	0
10. Ornamental flower pots of large dimensions of common red clay for specimen plants, and for terraces, three prizes........£3, £2, and	1	0	0

THE VIENNA INDUSTRIAL EXHIBITION OF 1865.

In a recent number of the *Journal** an account of the getting up of this Exhibition was given. The following is a statement of the opening and the results. The Exhibition was opened on the 17th of August last, by his Excellency Count Chorinsky. He was received by the members of the committee at the entrance, and, attended by them, proceeded to the great Hall. On his arrival, the choir of the printers' and the workman's musical societies sang the "Eichenkranz," and the band of the "Turners," or gymnastic association, played the "People's Hymn." Dr. Karl Helm then addressed the meeting, and thanked his excellency in the name of the committee for his kindness in presiding at the opening, and spoke at some length upon the utility of working classes industrial exhibitions. His excellency replied that the committee ought rather to be thanked for the labour they had taken in establishing and introducing such exhibitions into Austria. Herr Nikola said that as yet, and considering that only two months had elapsed

* Vol. xiii., p. 745.

between the issuing of the programmes and the opening day, the results had been most satisfactory. He thanked the various societies, the Imperial Royal Horticultural Society, and the Press, for all the assistance and support they had given the committee. After this his Excellency, accompanied by Herren Nikola and Helm, inspected the Exhibition. During the morning the band of the "Tuner" played various selections. The number of articles exhibited was 1,025, divided as follows:—

	Articles.
Class I. & II.—Objects of art, and professional art work	90
Class III.—Trade productions	334
Class IV.—Female handwork	25
Class V.—Amateur work	81
Class VI.—Mechanical and other articles of new invention	71
Class VII.—Miscellaneous	424
Total	1,025

The following juries were appointed:—For female hand-work, art and art workmanship, bookbinding, fancy work, engraving, shoemaking by hand, instrument making, tailoring, mechanical workmanship, steel workmanship, carpentering, workmanship in silver and metal, hair work, shoemaking, watch making, weaving.

The awards were as follows:—18 gold medals, 158 silver medals, 227 bronze medals, 210 honourable mentions; in all 613.

The Exhibition closed on the 1st of October, and the gold and silver medals were distributed by his Excellency Count Chorinsky, and the bronze medals and honourable mentions by Herren Lobmeyer and Ackermann on the same day. A deputation of the exhibitors waited upon the committee and thanked them in the name of the exhibitors. A concert and an improvised ball closed the proceedings. Besides this, all the prize-holders were invited by the committee of the Linz Exhibition to exhibit their articles at Linz, and the committee undertook to convey the articles to and from Linz free of cost. The number of visitors during the Exhibition was 51,410.

The account of the receipts and expenditure stand as follows:—

Receipts:—	fl.	kr.
Donations to the Prize Fund	917	3
Admissions	5,197	80
Entrance fees	13	8
	6,127	91
Expenditure	4,028	47
Showing a surplus of	2,099	44

Or about £175 sterling. And this surplus was handed over by the committee to various charitable institutions of Vienna.

OBSERVATIONS FOR CONSIDERATION PREVIOUSLY TO THE LAYING OF ANOTHER ATLANTIC CABLE.

By T. Seymour Burt, Esq., F.R.S.

The first Atlantic telegraph cable was actually laid between the shores of Ireland and America, in the year 1858; and by what means was it so efficiently laid without on any occasion, if I err not, its breaking or separating throughout any portion of its length, so as thereby to require the difficult, if not fatal, operation of hauling it in again to cut out the faulty part, and to effect its repair? How was it laid?—Why by making use of two ships instead of one, viz., the English *Agamemnon* and the American *Niagara*, which ships, each conveying out half the cable, having joined the ends of the same, and spliced them in central Atlantic ocean, steered away for their respective countries, which they satisfactorily, if not simultaneously reached, after having deposited these two halves of the cable in the bed of the sea, as well as having connected the other two ends with the ends of the coils proceeding from the two opposite shores. Well, this fact shows the possibility, or rather the practicability, of laying a cable between this country and America or Newfoundland. Then why has the operation not succeeded in the second instance?—Simply, because one ship only has been employed in the performance in the latter instance, instead of two ships. For, if two ships managed so well to lay a long cable in the first instance, why should only one ship have been employed on a second operation, and one, indeed, which has so specially failed? As time represents nearly everything with respect to the chances of storms occurring to disturb the equable paying out of the cable, it is manifest that if only one ship be employed in the operation instead of two, there must be four chances to one against the one ship escaping a storm in double the time, to that of the two ships escaping a similar calamity or inconvenience in half the time, as required for the voyage; besides, the two ships, before parting in mid-ocean, on depositing their joined ends of the cable in deepest water, being nearer one another can help one another in the most difficult portion of their course, or that where—if the cable should break at or over the central (or assumed) deepest part of the ocean—they would both remain, or, separating, would return to meet again, and so constantly to assist each other in recovering the escaped end of the coil. Whereas the one ship alone has no help at hand but its own. I should be disposed, therefore, to advocate the use of two such ships again, instead of one, in the operation of relaying the Atlantic cable.

But there is another argument against the use of one ship only. That ship must, like the *Great Eastern*, necessarily be of immense size, in order to be sufficiently capacious to contain, or stow away, the whole main length of cable, which consists of some 1,900 or 2,000 miles or more. Now, the greater the size of the ship the greater the stress exerted upon the cable when she raises her bow above the surface of the water—like as a giant pulls more strongly than a child. A smaller ship's haul or strain exerted upon the overhanging cable would not so tend to rend that cable (notwithstanding its tendency to rise to the wave to a greater height than the bow of the larger ship) as would the terrible dead weight and rise or stress or strain of the huge ship itself, the resistance of the cable being unnecessarily overpowered by the superior *momentum* of the latter vessel, and being thereby caused to be rent in twain, from the effect of the increased tension, which serves to break it like a piece of thread. And therefore, probably, if a very small ship or steamer could be steered in advance of the *Great Eastern*, on her next attempt, and could then be made to receive the descending part of the cable after it has left the latter ship, and, next, to deposit it directly over its own bow into the deep, the cable would be less liable to be torn asunder than if the big ship should pay it out alone and at once over its own bow directly into the abyss.

But why did the cable which had been first laid fail? A reply to this momentous question is printed in Part I., Vol. III., of my Miscellaneous Papers on Scientific Subjects, London, 1861, pp. 32-8, in a letter addressed to the late Viscount Palmerston, whilst Prime Minister, dated July 23, 1860.

I repeat the question. Why did the first laid cable fail, after having been properly laid from end to end? It failed simply because one-half of the length had been twisted (in manufacture) to the right hand of the line of its axis, whilst the other half had been twisted to the left hand of the same line or axis. How was this done? One of the halves had been manufactured on the banks of the Thames, the other half in another locality, the name of which I forget. Yet, strange to say, this fatal

defect was considered, it appears by the *Times* of the 13th of May, 1858, to have been remedied or "overcome" by joining the two ends, in midway Atlantic, to certain "rods of iron, loaded with a weight in the centre," which it was hoped—for it could not have been believed—would rectify the fault. And so the cable failed—as every mechanician ought to have known it would fail—and yet not even a trial beforehand was made of the two pieces—pieces contrarily twisted, be it remarked, and known to be so—by joining them together, I mean the half cable twisted to the right hand and the other half twisted to the left, in order to ascertain the effect of a heavy strain exerted upon those two halves when so joined. The consequence was that the so-joined coils, each consisting of one-half the whole cable, soon began to unwind and gradually to untwist themselves, until the electric pulses or pulsations, passing through the gradually attenuated core or copper wire, upon which the entire strain or stress was now thrown, became weaker and weaker, until they shortly afterwards, like my Uncle Toby's pulse in "Tristram Shandy," fluttered, stopped, beat again, and then entirely ceased! Nor was this effect to have been wondered at. Let any person of average common sense try the effect himself with two sets of small wires (or threads), three or four threads in each wire; one set twisted to the right hand the other set to the left hand of the axis of each coil, and then let him, after having joined one end of one coil to one end of the other by a firm knot, or even a "curved bar of iron," and after having stretched the whole coil in a straight line, with a stress bearing upon it, state from his own experiment, proof, and experience, what he considers to have been the main, if not sole, cause of failure of the first laid Atlantic Telegraph Cable.

It matters not with a cable manufactured in but one direction, *i.e.*, with the helix to the right or with the helix to the left, whether it be cut and then joined again either at the surface of separation, or at the opposite ends, or with the cut end of one portion joined on to the worn end, or to the furthermost end of the other portion, because the helix or twist would remain the same in any mode of junction throughout the entire line; but, I maintain that if any one portion of the one half be of a different twist to any portion of the other half, both portions of the coil situated near the point, or rather, surface of junction, will, on tension being applied, immediately begin to unwind themselves; and thus will transfer the tension they are intended to resist from themselves to the central copper wire they are intended to support, which latter will consequently become so attenuated from that powerful cause, as at least to separate itself into two detached parts, besides being more or less laid bare by the opening up (or out) of the outer helix, consisting of coils of wire and other substances placed for its protection. Let any one try the effect of the experiment, as I said before, and the result must confirm the entire correctness of this assertion. Therefore, I assume it to be absolutely necessary, in order to avoid certain failure, that all parts of the cable, shore-ends as well as others, should be manufactured of one uniform helix or coil.

The point now, however, for consideration is, how to lay the cable again after the occurrence of two not altogether unexpected failures? or, rather, how to lay a new cable, and that, if possible, without having to "haul in" again any portion of it after it has been "paid out," in order to discover the whereabouts of its faulty insulation, and with a certainty of weakening the chain or cable on every occasion that it is cut and again spliced. Now, this difficulty may be partially obviated by not having so very many splicing places in the original cable; for it must be evident that the greater the number of splicings or junctions in the same the less the chances of its efficiency. The parts "spliced" together cannot possibly be so strong or so closely connected, or the central wire (the vehicle of the electric message) so intimately adhesive in all its fibres, as the one originally manufactured in its integrity. What a large number of splicings or junctions there must have been in the late Atlantic cable; first, there was the batch of splicings required to join each of the several lengths sent down at different periods from Messrs. Glass and Elliott's workshops by each vessel that shipped a length to convey and join it on to its predecessor on board the Great Eastern. Then a splicing was required for each of the tanks when filled, or at any rate for two out of the three tanks in which the cable was stowed on board the leviathan ship. Next, the "splicing the main-brace" to the end at the Irish shore, and "yet another" splice would have been required at the junction with the land side on the American shore. "I'll see no more," as Macbeth says, almost dreading this long account of splicings in the late cable, and trusting it may be possible to avoid some of them in the new one. The first-laid cable was not so cut and so joined, it is to be presumed, as the second one, and yet the former was undoubtedly laid the whole distance, and for the moment successfully so—a message having been transmitted from end to end—from America to England, and this without the occurrence, that I am aware, of any breakage or separation of the coil (save one), in consequence of a mishap. How was this done? By the employment of *two* ships. And would not the cable have continued its insulation for a reasonable time—not expecting, of course, that it would have solved the problem of perpetual motion—had not its two halves been coiled, unfortunately in two contrary directions; and had they not still more unfortunately been joined together with that sad and fatal fault existing, although the fact was known at the time, or beforehand, certainly before the 13th of May, 1858, without a trial being made to ascertain whether the cable would, when so joined, succeed or not, and when such a trial would have caused but a few hours delay in the commencement of so great and glorious an undertaking.

In recommending, as I have done above, that two ships should be employed in the performance of this great work instead of one, I do not mean to infer that the operation cannot be completed by the Great Eastern herself, providing a smaller accompanying vessel can be steered but a little way ahead of her, for the reception of the descending cable as it descends from her bow, and before it is allowed to enter into the deep sea, as before explained. I would only desire to be understood as generally advocating the use of two ships instead of one in the execution of this vast undertaking, in the completion of which we all as Englishmen must feel so deep an interest.

One great means of control, however, should exist in the paying-out apparatus, which should be made by means of springs and wheels, or other self-adjusting arrangements, to apportion, at the required velocity, a sudden supply of slack cable, whenever a great and sudden rise of the ship's bow happens to take place, and to require the said supply as from a feeder, so that the amount of strain upon the cable should, if possible, be neither more nor less than a constant quantity. Upon this most important arrangement a great deal of the success of the work must necessarily depend; whereas a different principle will involve but little chance of such a desideratum.

Fine Arts.

Art Exhibitions in France.—The system of exhibitions of works of both pure and applied art is spreading itself rapidly over the whole of France; in addition to the number of annual exhibitions which take place in the chief towns of so many of the departments, and which have been noticed in the *Journal*, new ones are springing up, under the auspices of societies formed for the encouragement of art in various localities

and, in some cases, where such an attempt would scarcely be looked for. Amongst others, an exhibition of works of art of all kinds is announced to open at Pau, in the Pyrenees, on the sixteenth of January next, and to remain open till the fifteenth of March. A society has just been formed at Orleans, where in future there will be annual exhibitions of works of art. The *Moniteur des Arts*, of Paris, says that the action of the society, and consequently the scope of the exhibitions, will not be confined to painting, sculpture, drawing, and engraving, and quotes the following passage from the programme of the new society:—"The fact is recognised now that purity of line, harmony of colours, fitness of design and richness of composition, are the true characteristics of art, and such as inventive imagination can apply to objects of common utility as well as to the canvas on an easel, and that the useful does not exclude the beautiful." The object of the society is the encouragement and exhibition of art in all its forms, but apparently only in relation to the department in which it is situated and the surrounding departments; it is not the intention of the society, for the present at any rate, to invite the artists and art workmen of Paris and other places in France to exhibit at Orleans. Another large and important town, that of Lille, is about to establish an annual exhibition of the fine arts; there has not been anything of the kind at Lille for many years.

Artistic Metal Work in France.—The manufacturers and art workmen of Paris engaged in the production of works in bronze, cast iron, zinc, and silver, have a co-operative association, and by means of their own subscriptions, and those of the friends of art, who join the society as honorary members, are enabled not only to give a number of prizes, but also to aid their aged and invalided brethren. This society has just had an exhibition of the productions of its members, for which space was granted by the directors of the Conservatoire des Arts et Metiers; twenty prizes, and as many honourable mentions, with medals, were awarded for modelling, chasing, ornamentation, drawing, founding in bronze and iron, turning, and mounting. This association also appoints delegates who act as arbiters in cases of disputed copyright in works of industrial art. M. Crozatier, a well-known bronzist, has left, by will, a considerable sum of money for the foundation of an annual prize, to be given to the most distinguished working chaser in metals. The first competition for this prize is about to take place, the pieces being received at the Hôtel de Ville up to the twentieth of the current month of December.

Commerce.

Sugar.—Alvaro Reynoso's Cold Process.—Messrs. Travers call attention to this process as follows:—"Certainly no one can say that sugar manufacture is not advancing, when we have to chronicle in one year, Fryer's Concretor, the Alcoholic Process (of which we hope to give details shortly), and the Cold Process of M. Reynoso. True, neither of these inventions have as yet had any effect upon sugar-making in general, but they have also not been tried. Without them, however, a point has been reached, when, with vacuum pans, centrifugal machines, *appareils à triple effet*, and other old inventions and new applications, white sugar can be as cheaply made as brown, and when, were it not for the scale of duties, we should receive all our sugar in a fit state for immediate use. With regard to M. Reynoso's process, the following particulars are extracted from a paper read by that gentleman before the French *Académie des Sciences*, and reported in the *Comptes Rendus* of that body. M. A. Reynoso commences by saying:—'The process for the treatment of saccharine juices, which I have the honour to submit to the Académie is divided into two parts. 1st. Defecation. Chemists have long been occupied with the advantages that would result were aluminous substances used in sugar manufactures. Alum, sulphate of alumina, and alumina itself, in a more or less pure state, have been tried with more or less success in sugar manufactories. Evans has described in detail the way in which alum and the sulphate of alumina were used, and speaks of the good results that had been obtained in the English colonies. I myself have employed sulphate of alumina under different circumstances, but have seen that, side by side with considerable advantages, the use of this substance leads to serious inconveniences. Acid phosphate of lime has been used in Cuba since 1860, and particularly in 1863, in M. D'Aldama's works, by Mr. Swift, a distinguished American refiner, and I about that time described his process. I believe that I can now use alumina in a way to produce a defecation, perfect from a commercial point of view, and that I at the same time succeed in eliminating hurtful substances. The substance I use is acid phosphate of alumina. After having put it directly into the cane juice, the mixture is treated with lime; free alumina and phosphate of lime are thus formed. The reactions resulting from acid phosphate of alumina, from alumina, from phosphate of lime, and from lime added in slight excess, do away with the colouring matters, azotized bodies, &c., in such a way that only a few of the salts are left that originally existed in the juice. This defecation may be compared to that produced by sub-acetate of lead, but it has not its inconveniences. 2ndly. Separation of the Water. To evaporate the water contained in the purified juice, I employ *cold instead of heat*. I prevent in this way the numerous and complex reactions which, under the simultaneous influence of air and water, and heat coming between the different matters of which the juice is formed, cause the change in the colour of the sugar. By means of a rapid cooling, produced in suitable machines, I change the juice into a Magma—formed of a mixture of water reduced to the state of small pieces of ice, and of a syrup more or less dense, according to the conditions of the operation. To separate this mixture I have recourse to centrifugal machines, and I end the process by evaporating the syrup in vacuo. The details of the process will be found in my memoir.' This memoir has not yet been made public, and we shall await further particulars with some impatience. To give an opinion as to the value of the chemical part of the defecation, would be premature, and it is only in practice that its value can be determined. With regard to the separation of the greater part of the water by freezing, the idea is so simple, and yet so beautiful, that it cannot but excite admiration. It is well known that water when frozen rejects almost all alien substances, and that the ice even of a muddy puddle is pure, while the salt is driven out of frozen sea water. Whether the cold process will pay we cannot say, but M. Reynoso deserves every credit for the application of a well-known principle to sugar-making, and we may conclude by wishing that gentleman the success to which his efforts entitle him."

Relative Value of Manure.—It appears that this subject has been recently discussed in some of the West Indian journals, and is exciting a considerable degree of interest in these islands, especially among sugar-growers. The discussion originated with a letter, which appeared in the columns of the *West Indian*, a Barbadoes paper, calling attention to the results of some experiments by M. Ville, a Professor of Vegetable Physiology at Rouen, who, after a series of experiments, extending over fifteen years, comes to the conclusion that there are four, and only four, elements which perform an important part in promoting the growth of vegetable productions; that these are lime, potass, phosphate of lime, and nitrogenous substances; and that the combination of these four constitutes a perfect manure; but, though the presence of all four of these constituents is necessary for the improvement of a soil which shall be capable of producing all the various forms of vegetable life, among these four agencies there is

stated to be for each peculiar crop a dominant element, thus:—for wheat and beet-roots, nitrogenous matter would be most required; for vegetables, potass; and so on. In the soil—the marls, the chalk, the megass ash of Barbadoes, they can obtain at once lime, phosphate, and potass, whilst Peruvian guano would supply them with the remaining element—nitrogenous matter. What the probable result of such an application of manure would be, may be inferred from the continually increasing prosperity of Mauritius. In that island the sugar returns have, of late years, increased to an enormous exent, though not a single additional acre has been brought into cultivation.

Rice in Italy.—Mr. Sackville West, in his "Commercial Report on Italy for the year 1863," says that rice is more extensively cultivated in Italy than in any other part of Europe, although the date of its introduction in comparatively recent. Its cultivation, for sanitary reasons, has always been more or less restricted by legislative measures, and the question as to whether it is really pernicious or not to the health of the surrounding populations has ever been and still is seriously discussed. The rice which is grown in Italy must be cultivated under a system of irrigation. There does not appear to be sufficient humidity in the air to admit of the successful cultivation of the species "mountain rice" (riso di montagna) which was brought by M. Poivre from Cochin China to the Mauritius, from whence it was subsequently brought to Europe, where it is proved to have germinated and come to maturity in climates possessing the requisite amount of humidity. Neither the Greeks nor Romans appear to have cultivated rice, although it is certain they knew of such produce as coming from Asia by the Red Sea to the ports of the Mediterranean. The Arabs are supposed to have cultivated it, and to have introduced it into Egypt and the southern parts of Europe with which they came into contact, but nothing is certain as to its existence in Europe until its introduction into Spain by the Moors in 1324, although a certain Peter Crescentius mentions it as growing in the marshy lands about Bologna as early as 1301. There are legislative enactments extant of Francesco Sforza and Ludovico the Moor, which prove that it was cultivated to a considerable extent in the Milanese in the fifteenth century. In the year 1585, the Spanish Governor of Milan, the Marquis Aymonte, prohibited it as a pestiferous production. Notwithstanding, however, all efforts to restrict its extension, it continued to spread throughout Italy, especially on the coasts of the Adriatic about Venice and Ancona in the valley of the Po. In Spain and Portugal sufficient care and attention were not bestowed on its cultivation as to render the crop important. It was grown to some extent in some parts of France until Cardinal Fleury put a stop to its cultivation, and at the present time it is by no means a profitable speculation. In Italy, however, the contrary is the case, and the crop is most remunerative, but it is a matter of serious consideration for the Government to decide the question as to its pernicious effect on the health of the population, and if necessary, to adopt the most judicious measures to prevent the evil consequences consequent on an undue extension of its cultivation near great towns.

Colonies.

Progress in New Zealand—The principal street in Hokitika is Revell-street, nearly half a mile long, containing 246 buildings, substantial and commodious business places. There are 55 stores, consisting of wholesale merchants, drapers, ironmongers, commission and shipping agents, grocers, fruiterers, &c., each and all apparently doing a thriving business. There are eight butchers in this street, nine shoemakers, six blacksmiths, four restaurants, three chemists, three banks, &c., &c. There are also two saddlers, two doctors, two barristers, four stationers, three jewellers, two auctioneers, and one printing office. The hospital is the only public building in Hokitika.

North Australia.—Mr. A. C. Gregory, the explorer, speaks in very high terms of this country. Estimating the progress of settlement at its present rate, it is anticipated that in about three years a cordon of stations from the Albert to Adam's Bay will be occupied. The rate of progress will depend greatly upon the success of the settlements established by the South Australian Government at Adam's Bay, or at any spot to which the settlers may remove. The country generally is well watered—water, in fact, is very abundant around the gulf and the Victoria, excepting the upper part of Arntreim's Land. As soon as the stations on the gulf are sufficiently established stock will be able to be driven from the southern districts of Queensland to the north-western coast, making the gulf a stepping-stone between the two. It would take two years to start from Darling Downs with stock to reach the Victoria River, because the seasons follow in such a way that certain portions of the country would only be practicable at different periods.

Sugar-growing in Queensland.—The cane planted in August and September is reported to be above ground from six to twelve inches, and with the warm dewy nights will make rapid progress. The ratoon crops show ten to twenty vigorous shoots per stalk. From the north reports are all favourable. Clearing, stumping, and ploughing are being carried on with great energy. Extensive operations are going forward at the Cabulture Sugar Company's estate, and before the season for planting is closed it is believed that 200 acres will be ready for the reception of the plant. The difficulty, both north and south this season, has been the procuring of plants.

Trade of Adelaide.—The declared value of imports and exports at Port Adelaide, during the present year, up to August, was as follows:—Imports, £1,672,560; exports, £1,429,529. A comparative statement of the imports and exports of Port Adelaide during the first thirty-three weeks of 1864, shows that the imports were then £1,400,173; the exports, £1,661,915; thus, in the present year, there is an increase in the imports of £272,387, but a decrease of £232,380 in the exports. The sales of crown lands from the commencement of 1865 to August 24, were as follows:—

Public auction	179,426 acres, realising	£303,764
Private sales ..	27,477 " "	28,769
	206,903	£332,533

During the corresponding period of the years 1859 to 1864, inclusive, the sales have averaged 76,260 acres, realising £100,795.

Public Works in New South Wales.—The moderate sum voted last session for the construction of public works appears to have been nearly all expended. Scarcely any sum was voted for new works, so much as for the maintenance of roads, railroads, the completion of jetties, wharves, and public buildings already in hand. The various railway extensions are progressing very slowly. In Bathurst a Railway Extension Association has been formed, and meetings are being held for the purpose of influencing the Government to push on the railway extension to the western districts more rapidly. In the southern districts an Association has also been formed at Braidwood for the purpose of inducing the Government to form a branch line to connect Braidwood with Goulburn.

Publications Issued.

Chemistry for Students. By Dr. A. Williamson, F.R.S., F.C.S., &c., Professor of Chemistry at University College, London. (*MacMillan and Co.*)—This is one of a series of educational works emanating from the

Clarendon Press, Oxford. The object of this book is to afford students in chemistry an insight into the most interesting and useful facts in that science, and to supply an outline of the most important ideas which may be obtained from a study of such facts. The method of exposition differs from that which is adopted in most other treatises of chemistry. The author describes and compares individual facts so as to lead the mind of the reader towards general principles, instead of stating the general principles first and then proceeding to illustrate them by details. This book is intended for the use of beginners, and also of such students who, having made some progress in the science, may wish to have an outline of the chief facts and theories of mineral and inorganic chemistry. A series of questions are appended to the first few chapters, and students would do well to work out the answers to them, and thus practise themselves in using the elementary facts of chemistry. The author proposes to publish shortly answers to these questions.

Drawing from Nature. By George Blanchard. (*Longmans.*)—This work consists of a series of progressive instructions in sketching, from elementary studies to finished views, with examples from Switzerland and the Pyrenees. To this are added lectures on art delivered at Rugby School. The whole is illustrated by sixteen coloured and lithographic plates, and more than a hundred woodcuts. The author, who is Professor of Drawing at Rugby School, prefaces his introduction with the following words of Lord Brougham:—"Drawing is of the greatest use in after life, and above all it has the effect of leading to accurate habits of observation, and a more distinct knowledge and mechanical facility than almost any other kind of manipulation; it is a sovereign remedy for correcting idle habits, and of the greatest benefit to the scholar—it is a most admirable adjunct to education."

Notes.

Funeral of the Late Captain Fowke, R.E.—In addition to the names already published, we are informed that Mr. Hope, the President of the Royal Institute of British Architects, Mr. Tite, M.P., Mr. Donaldson, Mr. Gilbert Scott, R.A., Lord Henry Lennox, M.P., Mr. Charles Manby, Mr. J. Clutton, &c., had written to express regret at their unavoidable absence.

Female Education in France.—A young lady, twenty years of age, daughter of a naval officer, has just received the degree of Bachelor of Letters, at Montpellier, having passed through the competitive examination with great distinction. Mdlle. Antonia Cellarier took the first place in translation from the Latin, and the fourth for Latin composition, with nineteen competitors. Montpellier is the fourth town in the empire that has conferred the degree of Bachelor on a female pupil, the other three being Lyons, Bordeaux, and Algiers.

Continental Telegraphic Convention.—An Imperial decree has just been published in Paris promulgating a convention, concluded in May last, between France on the one part, and Belgium, Austria, Baden, Denmark, Spain, Greece, the City of Hamburg, Italy, Holland, Portugal, Prussia, Russia, Saxony, Sweden and Norway, Switzerland, Turkey, and Wurtemburg on the other, and which has for its object the organization of the entire telegraph system and the establishment of a fixed international tariff. The dispatches are classed under three heads, those of the state, or governmental dispatches, those connected with the public service, and, lastly, private telegrams. The tariffs will fix the amounts to be received by each country as regards transmission, receipt, and transit. The ratifications have been exchanged between all the powers, with the exception of Greece, Portugal, and Turkey, in which there has been some delay, and the convention is to come into operation on the first day of the coming year. This arrangement will be of essential service to the commercial world by doing away with inconsistencies, and setting up a regular and fixed scale of charges.

The Popularisation of Art in Belgium.—M. Hendrickz, a Belgian painter and inspector of the drawing classes in the communal schools of Brussels, has been for some time in Paris making experiments, under the direction of the Minister of Public Instruction, in teaching working men, utterly ignorant of art, to draw, after a method of his own, which has proved highly successful in Belgium. A class of fifty adults was formed in August last, at the Lycée Bonaparte; the pupils included young men studying under the Polytechnic Institution, clerks, engineers, and fitters employed by the Western Railway Company, and other workmen. One only of these had any notion of drawing, yet, after twenty-two lessons of one hour each, it is reported that all were able to execute complicated drawings with firmness and taste. The Minister has decided that the experiments shall be continued at the Lycée Charlemagne, by M. Bourson, another artist, and colleague of M. Hendrickz; the course is to be divided into two classes of thirty-five pupils each, one for the elementary stage, and the other for more advanced pupils. Other courses are to be opened by the same teacher, at the primary normal school of Versailles, one for the pupil teachers and the other for the youths in the school.

Sponges.—Mr. Newton's *Travels and Discoveries in the Levant* contains the following in reference to the sponge divers of the Isle of Calymnos, who sail in a fleet of caiques for the coast of Asia Minor and Syria during May, and fish up annually £16,000 worth of sponge:—"The diver descends, holding a flat stone in both hands, to assist him in sinking, on which stone a cord is fastened. When he gets to the bottom he puts this flat stone under his arm and walks about in search of sponges, putting them in a net hung round his neck as fast as he uproots them; he then pulls the cord as a signal, and is drawn up again. It is said that the best divers can descend to a depth of 30 fathoms, and that they can remain under water for as long a period as three minutes. From inquiries which I have made, it does not appear that they are often cut off by sharks, though these monsters are not unfrequent in the southern part of the Archipelago. It is possible that the rapid descent of the diver may scare away this fish, who generally seizes his prey on the surface. A Calymniote told me that the most terrible sensation he had ever experienced was finding himself close to an immense fish at the bottom of the sea. Under the root of the sponge is a parasitical substance of a caustic nature. This often bursts when the sponge is suspended round the diver's neck, and the liquid it contains causes deep ulcers in his flesh." Before exportation the sponges are cleansed and spread out in fields to dry. Acres of them may thus be seen exposed in fine weather. Sponges are sold by weight, and formerly the weight used to be increased by introducing a little sand. To prevent this fraud, the merchants insist upon their being filled with as much sand as they can hold, and as this amount can be accurately calculated, it is deducted from the gross weight. Hence arises the deposit of sand which a new sponge leaves at the bottom of the basin.

Correspondence.

The Late Captain Fowke, R.E.—Sir,—As the writer of some of the notices in "the architectural press," of the designs for the Natural History Museum buildings, proposed in 1864 to be erected at South Kensington, I beg to contradict the assertion which Mr. Cole is reported to have made at the meeting of the Society of Arts, on December 6th, that "the architectural press" had "fully confirmed the decision" of the judges; and I shall feel obliged by your reading the contradiction at the meeting

this evening of your society, and by your inserting it in the next number of your *Journal*. On reference to the leading article of the *Builder* of April 23rd, 1864, it will be observed that no design was indicated as deserving of selection; but that the conspicuous position in the Exhibition, and the execution and mounting of the drawings afterwards found to be Captain Fowke's, were referred to; whilst the arrangement of the plan and the manner of lighting, were alluded to as possibly defective. Moreover, in the following number of the same journal, hope was expressed that a rumour of some decision having been arrived at was incorrect. On this latter occasion the improbability that there could then have been a decision of any value was pointed out; and again, on May 14th, the little value of the decision was made apparent, in remarks on the design to which was given the third premium,—a design which, though by an architect of great ability, was impracticable, as it was shown; and which the professional men of the judges, by their selection of it, appear to have failed to see was impracticable. As to the actual merit of Capt. Fowke's design compared with other designs, the question is one that I do not touch; and I have not a fragment of a desire to depreciate the abilities of Capt. Fowke—which were very great, and whose personal character seems to me to have deserved all that Mr. Cole would say in favour of it. But, deeply regretting his early removal, I feel that it is important to the issue of any future proceedings connected with public works and architectural art, to know that the judges in the case to which Mr. Cole referred (professional men though they were) did not, in the opinion of "the architectural press," decide the question submitted to them after such examination of the whole number of works that they were called upon to consider, as would have been necessary for acquaintance with the features of those schemes, and much less for a judgment upon them.—I am, &c.,

EDWARD HALL.

3, Adam-street, Adelphi, 20th Dec., 1865.

To Correspondents.

ERRATUM.—In last number. page 71, col. 2, line 16, for "lb." read "bl."—*i.e.*, for "pound," read "bushel."

MEETINGS FOR THE ENSUING WEEK.

TUES.... Royal Inst., 3. Prof. Tyndall, "On Sound." (Juvenile Lectures.)
THURS.. Royal Inst., 3. Prof. Tyndall, "On Sound." (Juvenile Lectures.)
SAT. ...Royal Inst., 3. Prof. Tyndall, "On Sound." (Juvenile Lectures.)

Patents.

From Commissioners of Patents Journal, December 15th.

GRANTS OF PROVISIONAL PROTECTION.

Animal and vegetable substances, preserving—2952—R. Jones.
Baths—3129—E. Headly.
Brushes—3060—J. Stokes and T. Gray.
Butter—2936—H. Clifton.
Cement—3119—R. A. Brooman.
Coal, &c., machinery for getting—3127—G. E. Donisthorpe.
Coffins, air-tight—3014—H. J. Cox and W. Loach.
Compasses—3083—I. J. Handley and C. Wilkins.
Disinfectants—3115—J. Tomlinson.
Doors, &c., knobs for—3081—J. Wilson.
Enamel, &c., composition for—3042—W. R. Lake.
Fibrous substances, cleaning—3137—G. Macdonald.
Fibrous substances, preparing—3123—I. Holden.
Fibrous substances, 'top rollers' used in making—3073—J. Kerfoot.
Fire-arms, breech-loading—3113—E. C. Hodges.
Floors and doors, preventing draughts between—3050—L.D. Carbonnier.
Forge furnaces—3109—W. Beardmore.
Furnaces—3095—E. B. Wilson.
Furnaces, combustion of fuel in—3062—T. Lancaster.
Furniture, a convertible piece of—3057—T. Laurie.
Gas fittings—3069—W. Johnston.
Head, coverings for the—3056—H. A. Bonneville.
Heavy bodies, moving—3093—T. A. Weston.
Illusory exhibitions, apparatus for—3139—J. H. Pepper & T. W. Tobin.
Insulators—3121—J. Prest, H. Harrison, and B. Roeber.
Iron and steel, casting—3018—J. Whitworth.
Iron, forging—3027—J. Arrowsmith.
Iron, treating the oxide of—3099—T. Bell.
Iron, wrought—3034—G. T. Bousfield.
Metal bedsteads—3135—H. B. Hamilton.
Metal tubes—3117—P. A. Muntz.
Motive power, obtaining—2080—W. T. Cole, H. S. Smith, and A. Soares.
Motive power, obtaining—3016—J. Wauthier.
Oils, distilling—3101—T. N. Bennie.
Paper—3041—W. E. Newton.
Pipe wrench, a combined adjustable spanner, tube cutter, and—3036—J. P. Baragwanath.
Rails, locomotive engine wheels adhering to the—2977—A. Vescovali.
Railway chairs—3131—J. Taylor.
Railways—3024—A. V. Newton.
Screw gill boxes—3038—W. Hodgson.
Sewing-machine needles—3143—N. Salamon and W. J. L. Davids.
Shaft shackles—3044—W. R. Lake.
Spirituous liquors—2962—P. J. Fallon.
Spirituous liquors, purifying—3071—W. Thompson.
Stables, &c., disinfecting—3075—J. Gamgee.
Stays, &c.—3049—E. Drucker.
Steam boilers—3141—W. E. Newton.
Steam boilers, water guages for—3026—J. Draper and W. Leech.
Steam cylinders, preventing the escape of heat from—3051—W. Simons and A. Brown.
Steam, registering the pressure of—3077—J. L. Norton & J. Landless.
Steel, &c., casting—3030—F. Trachsel and W. Hall.
Sugar—2606—J. A. Leon.
Textile fabrics, shrinking—3020—S. C. Salter.
Thrashing machines, beaters for—2992—W., E., and J. Gray.
Trunks or packages, shields for—3022—W. E. Newton.
Umbrellas and parasols, stretchers for—3097—R. Cook.
Weaving, healds for looms for—3028—R. T. Hothersall, S. Cook, and W. H. Hacking.
Weaving, looms for—3091—E. Scott.
Weaving, ornamental—3145—W. H. Clabburn.
Wood, cutting mouldings in—3040—W. E. Newton.
Woven fabrics, producing scarlet colours upon—3111—A. Paraf and R. S. Dale.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Steam boilers—3184—N. W. Wheeler.

PATENTS SEALED.

1637. W. Howes and W. Burley.	1669. C. T. Porter.
1652. W. E. Gedge.	1686. E. Finch.
1661. D. McGlashan.	1723. R. Boot and J. Coxon.
1663. E. Dupont.	2088. H. R. Guy.
1666. W. E. Gedge.	2119. J. B. Brown.

From Commissioners of Patents Journal, December 19th.

PATENTS SEALED.

1559. A. Barff and E. L. Sim.	1724. P. Jacovenco.
1674. E. K. Dutton.	1808. J. Willis.
1691. R. A. Brooman.	1898. J. H. Wray.
1693. P. A. le C. de Fontaine-moreau.	2429. H. A. Bonneville.
1694. F. G. David.	2432. W. Turner, S. Shore, and W. Halliwell.
1696. C. R. Bamber.	2436. T. V. Lee.
1705. J. Whittle.	2453. W. E. Newton.
1712. J. Spratt.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3394. I. Holden.	3397. W. S. Longridge.
3395. I. Holden.	3336. J. W. Baker.
87. R. Luthy.	3384. J. Clayton.
3331. C. Hancock & S. W. Silver.	3404. A. T. Blakely.
3379. G. A. Huddart.	3366. W. Tongue.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

39. J. Howard.	2896. J. Kerr.
2876. J. Wardill.	2900. J. MacKenzie.

Registered Designs.

The Shield Envelope—December 5—4755—W. H. Hook, 2, Hansey-street, Walworth.
Rotary Water Trough or Cistern for Stables and other purposes—December 9—4756—J. Barton, Oxford-street, W.
Safety Lever and Joint connected therewith for Stopping or Reversing the Motion of Chaff-cutting Machines—December 11—4757—C. W. Otway, Reading, Berks.
Collar Holder—December 13—4758—Messrs. Baldock and Deane, Phœnix Works, Cambridge-road, E.

Journal of the Society of Arts.

FRIDAY, DECEMBER 29, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

January 17.—"On Automatic Telegraphy." By Alexander Bain, Esq.

January 24.—"On the Uses of National Museums to Local Institutions." By Lord Henry G. Lennox, M.P.

Cantor Lectures.

The concluding Lectures of the Course by G. W. Hastings, Esq., LL.D., will be delivered as follows:—

Lecture III.—Monday, January 15th.—"On Copyright and Trade Marks."

Lecture IV.—Monday, January 22nd.—"On Limited Liability."

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing one Friend to each Lecture.

The tickets already issued will be available on these evenings.

Peat as Fuel.

The sum of £50 placed in the hands of the Council by J. Bailey Denton, Esq., to which is added the Society's Gold Medal, is offered for the production of a fuel from Peat, which shall be equal in quality to good household coal for ordinary purposes, and capable of being sold in the market commercially at less cost than such coal. The attainment of this object must be demonstrated practically and on a commercial scale.

Prizes to Art Workmen.

The following is a catalogue of the works sent in competition:—

FIRST DIVISION.

Works to be Executed from Prescribed Designs.

1. Carving in Sicilian Marble.—"*Boy and Dolphin*," by John Willis, 32, Brewer-street, Pimlico, S.W.
2. Carving in Stone.—"*Boy and Dolphin*," by Alexander Kenmure, 43, Pancras-square, St. Pancras-road, N.W.
3. Carving in Sicilian Marble.—"*Boy and Dolphin*," designed for a fountain, by R. Wallace Martin, 5, Olney-street, Walworth, S. Price (when completed) 25 guineas.
4. Carving in Stone.—Panel, after chair-back in the South Kensington Museum, by "Hope." Price £10.
5. Carving in Walnut Wood.—Panel, after chair-back in the South Kensington Museum, by James Stuart, 7, Pancras-square, N.W.
6. Carving in Stone.—Bracket, by H. Coles, 13, Hercules-terrace, S. Price £5.
7. Repoussé Work in Metal.—"*Raphael's Three Graces*," by George Norton, 280, Beet-street, Sheffield. Price £20.
8. Ditto, "*Raphael's Three Graces*," by "H.H.B."
9. Ditto, "*Raphael's Three Graces*," by Thomas Bayley, Rann-street, Ladywood, Birmingham.
10. Ditto, "*Raphael's Three Graces*," by "N.N.C." Price £16.
11. Ditto, "*Raphael's Three Graces*," by Charles Pettit, 2, Anglesea-street, Lozells, near Birmingham. Price £35.
12. Ditto. A Tazza, after an example belonging to Sir W. C. Trevelyan, Bart. By S. Beresford, 29, Myddelton-street, E.C. Price £8.
13. Hammered Work in Metal. Adapted for use as a Bracket, by T. Winstanley, 7, Stanhope-street, Newcastle-street, Strand, W.C.
14. Ditto, Bracket, by W. Letheren, Lansdown Iron Works, Cheltenham.
15. Ditto, Bracket, by "Z."
16. Carving in Ivory.—Statuette, after example in the South Kensington Museum, by J. W. Bentley, 22, Sherwood-street, Golden-square, W.
17. Ditto, Statuette, by James Steel, jun., 25 Holmhead-street, Glasgow.
18. Chasing in Bronze.—After *Goutier*, by G. R. Meek, 26, Harrison-street, Gray's-inn-road, W.C. Price, £15.
19. Ditto, after *Goutier*, by George Gibaud, 55, Bridport-place, New North-road, N. Price, £15.
20. Ditto, after *Goutier*, by H. J. Hatfield, 16, Alfred-street, Tottenham Court-road, W.C. Price, £15.
21. Ditto, after *Goutier*, by R. Reynolds, 15 Oak-village, Kentish-town, N.W. Price, £15.
22. Engraving on Metal.—Arabesque, after *Lucus Van Leyden*, by "G. S. B."
23. Enamel Painting on Metal.—After "*Raphael's Three Graces*," by W. J. W. Nunn, 10, Gardham-street, Bromehead-street, Commercial-road, E. Price, £15.
24. Ditto, "*Raphael's Three Graces*," by E. Autran, 4, Nassau-street, Soho-square, W. Price, £21.

25. Ditto, after German Arabesque, by Frederick Lowe, 13, Wilderness-row, E.C. £15 15s.; further copies, £21.

25. Painting on Porcelain.—"*Two Children*," after *Raphael*, by E. Autran, 4, Nassau-street, Soho, W. Price, £10.

27. Ditto, "*Two Children*," after *Raphael*, by Alexander Fisher, 5, Clyde-street, Stoke-upon-Trent.
28. Ditto, "*Two Children*," after *Raphael*, by J. B. Evans, South-st., Mount-pleasant, Fenton, Staffordshire.
29. Ditto, Arabesque, after *Lucas Van Leyden*, by Alexander Fisher, 5, Clyde-street, Stoke-upon-Trent.
30. Decorative Painting.—Ornament, by Thomas Emery, at Mrs. Horwell's, Market-street, Stoke-upon-Trent. Price £3.
31. Ditto, Ornament, by Thomas Longmore, Hardinge-street, Fenton, Staffordshire. Price £2 10s.
32. Ditto, Ornament, by John Henk, George-street, Stoke-upon-Trent. Price £3.
33. Inlay in Metal.—Ornament, by T. R. Rice, 18, Suffolk-street, Essex-road, N.
34. Cameo Cutting.—Heads of the Queen and Prince Consort, after the Jurors' Medal of 1851, by T. Ronca, 156, King's-road, Chelsea, S.W.
    Ditto, after "*St. George and Dragon*" on Prince Consort's Medal, by T. Ronca, 156, King's-road, Chelsea, S.W.
35. Wall Mosaics, after *Bertini* of Milan, by G. H. Stevens, Lambeth Glass Works, Carlisle-street, S. Price, £15.
36. Die Sinking.—After Wyon's head of the Prince Consort on the Society's Medal, by A. Bouchette, 12, Perceval-street, E.C.
37. Ditto, Head of Prince Consort, by G. Morgan, Birmingham.

38. Ditto, Head of Prince Consort, by Henry Allen, Franchise-street, Birchfields, near Birmingham.
39. Bookbinding.—"*Virgilii Carmina*," foliage border (Mosaic), by Louis Genth, 90, High Holborn, W.C. Price £10 10s.
40. Ditto, "*Horatii Opera*," Maioli style, by the above. Price £8 8s.
41. Ditto, "*Valerius Maximus*," by John Jeffrey, 61, Charlotte-street, Portland-place, W. Price £7.
42. Illuminations.—Specimen by W. W. Burgess, 21, Market-street, Curzon-street, W. Price £10.
43. Ditto, Specimen by W. G. Hooper, 18, Finsbury-place, North, E.C. Price £5.
44. Ditto, Specimen by Miss Mary R. David, 4, Anderson-street, Chelsea, S.W. Price £1.

SECOND DIVISION.

Works to be Executed Without Prescribed Designs.

Wood Carving.—(*a*.) *Human figure in the round, in alto, or in bas relief. Animals or natural foilage may be used as accessories.*

45. "*Abraham's Sacrifice*," panel carved by James Pearce, 7, Bloomfield-place, Portobello, Dublin. Price, £25.
46. "*Disarming of Cupid*," by Charles Liddle, 72, Pancras-square, N.W. Price, £20.
47. "*Introduction of Music to the Arcadians*," carved by J. Meiklejohn, 58, Sussex-street, Pimlico, S.W.
48. "*Puck*," carved in pear-tree wood, by G. Rumford, 19, Eccleston-street East, S.W. Price, £12.
49. "*Purity*," by G. F. Bridge, 3, Vincent-square, Westminster, S.W.
50. "*Happy Moments*," by the above.
51. Italian Panel, with figure of "Wisdom," carved in oak, by Henry Jones, 9, Bedford-street, Seymour-street, Euston-square, N.W. Price £10.

(*b*.) *Animal or still-life. Fruit, flowers, or natural foilage may be used as accessories.*

52. "*Eagle and Prey*," group in lime tree, by John Neaves, 26, William-street, Regent's-park, N.W. Price £10.

(*c*.) *Natural foliage, fruit, or flowers, or conventional ornament, in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.*

53. Festoon of Flowers, by R. Baker, 11, King-street St. James's, S.W.
54. Oak Altar Chair, by A. H. Holmes, 101 Dean-street, Soho, W.C. Price £10.
55. Panel in lime tree, by J. F. Booth, 5 Crown-terrace, Haverstock-hill, N.W. Price (when completed) £7.
56. Pear tree frame, by G. H. Bull, 34, Albert-street, Regent's-park, N.W. Price £25.
57. Frame in oak, by the above. £12.
58. Frame in oak, by the above. £7.
59. Frame in chestnut, by the above. £5.

Works sent in Competition for the Prizes offered by the Worshipful Company of Plasterers.

60. Model of Truss or Bracket, by James Steele, jun., 25, Holmhead-street, Glasgow.
61. Renaissance Bracket or Truss, by R. W. Hanwell, 59, Charlotte-street, Caledonian-road, N.

Works for Exhibition only.

62 and 63. Brackets in Leather Work, exhibited by F. J. F. Shippard, Turnham Green, W. (Not for sale.)

64 and 65. Looking-glass Frames in Leather Work, by the above. (Not for sale.)

66. Mosaic Panel. "*St. Margaret*," after a design by Wolgenurth, and worked by Robert Hann Messrs. J. Rust and Co., Lambeth Glass Works S. Price £40.
67. Sketch in Wood, from an Italian picture-frame in possession of Henry Vaughan, Esq., by Henry Jones, 9, Bedford-street, Seymour-street, Euston square, N.W.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Musical Education Committee.

The Committee met on Tuesday, 12th December, Henry Cole, Esq., C.B., in the chair. There were also present—Lord Gerald Fitzgerald, Sir John E. Harington, Bart., Colonel Scott, R.E., Edgar A. Bowring, Esq., C.B., and Capt. Donnelly, R.E.

P. Le Neve Foster, Esq., Secretary of the Society of Arts, examined by the Committee:—

409. You have been charged by the Council of the Society to proceed to Brussels for the purpose of collecting full information respecting the Conservatoire Royal de Musique there, and the Conservatoire at Liège?—I received instructions to go to Brussels, and when there I obtained some information with respect to Liège.

410. With whom were you in communication in Brussels?—With M. Fétis, director of the Conservatoire; and M. Cornélis, the professor of singing. From them I obtained information and documents, which I have embodied in a report.

411. At what period of the year were you in Brussels?—The second week in August.

412. Was the Academy sitting at that time?—It was just closed.

413. The result of your inquiries is embodied in the report which you have now in hand?—It is.

414. Do you desire to add anything now to the information contained in your report?—Nothing further that I am aware of at present.

REPORT.

Brussels.

In compliance with the instructions given by the Council, I visited Brussels, and placed myself in communication with M. Fétis, the director of the Conservatoire Royal de Musique, and also with M. Cornélis, professor of singing in that establishment, both of whom kindly furnished me with the information I was seeking. The Conservatoire is a Government establishment, and supported by public funds by vote of the Chambers, and by a subsidy from the town and the province, as well as by fees from foreign pupils. The instruction given is absolutely free to all Belgians of both sexes; foreigners are admitted on payment of an annual fee of £8 sterling.* The instruction thus given is only for those intended for the profession, and not for amateurs; but, inasmuch as there is no control over the students after they leave the Conservatoire, practically the education is open to all, without distinction.

* This rule as to payment by foreigners was made a few years ago, as I was told, on the occasion of De Beriot, the violinist, bringing up his class to the public competitions, composed entirely of foreigners.

The branches taught are—1. Solfeggio and reading music; 2. Singing—solo and concerted; 3. The organ; 4. Stringed and wind instruments and the piano-forte; 5. Thorough-bass and accompaniment; 6. Composition; 7. The Italian language and Latin pronunciation; 8. French declamation. There may be, in addition, a class for the plain chant, for acoustics, and for musical æsthetics. A Director, Professors, supplementary professors, and *répétiteurs* have charge of the instruction.

The administration of the institution is under the charge of a Commission of seven members, including the president, all of whom are named by the King. It chooses a vice-president and treasurer from among its own body. The Burgomaster of Brussels is honorary President. The Director and secretary, who is also librarian, are not members. The Commission proposes to the minister, jointly with the Director, all the officers. It regulates all the expenses, the discipline, and interior economy, and in consultation, the Director fixes the number of *répétiteurs* and pupils in each class. The Commission meets once a month, and annually settles the budget of expenses with the Director, and presents a report. Once every three months, at least, the members must make an inspection of the classes. Every member who has been absent from the meetings of the commission for six months ceases to belong to it.

The Director is appointed by the King, and can be removed by a ministerial decree. He has the general direction of the studies, methods of study, and the discipline of the classes as regards both professors and pupils. He may attend the deliberations of the Commission, but has no voice in it. He examines and admits or receives pupils, reporting the same to the Commission. He has charge of the furniture, instruments, and of the property of the establishment generally. With him, assisted by the professors of singing and instrumental music, rests the admission or rejection of the candidates.

Candidates for admission as pupils must be able to read and write, and must bring certificates of birth. They must be above seven years old. After 12 they cannot be admitted to the solfeggio classes, unless they can read music. After 15, they are not admitted to an instrument class unless they show a certain aptitude, and can read music. They can enter the singing classes up to the age of 25, provided they can read music. Those admitted commence their studies the first Monday in October annually. The pupils cannot be absent without leave from the professor, or more than one day in the month without leave from the director, and only for serious reasons. After prolonged absence they are re-examined before re-admission.

The Professors and sub-professors are responsible for the conduct of their classes, under the supervision of the Director. Leave of absence may be given them for a fortnight by the Director; for a month by the Commission; for beyond that period by the minister, under the advice of the Director and the Commission, but not more than once in the year, without the special authority of the minister. Absent professors are re-placed by sub-professors or *répétiteurs*. The former receive the salary of the professors during their absence. If the absence is unavoidable for important reasons, the professor only loses half his salary for the time. If absent for a fortnight or for a month with a medical certificate he loses nothing; beyond that time a quarter of his salary is taken for the benefit of his substitute. Any professor absent without leave or illness is fined two days' salary. Prolonged absence is reported to the minister, and visited with dismissal or suspension. Professors named by the Director take part in the practices and public and private performances. The Director chooses the *répétiteurs* from the most distinguished pupils. They have an annual salary, and after two years' of approved conduct may succeed to a vacancy as sub-professor. There is an officer termed Superintendent of studies, who is responsible for the order of the studies, and for the maintenance of discipline in the classes. He registers and makes a daily report of the presence or absence of the teachers and pupils, and must be present a quarter-of-an-hour before and during the time of study. He has under him servants who attend to the classes, fill the offices of messenger, porters, and orchestra men. He has also the care of the instruments.

The library contains—1. Works on the theory and practice of music, for the use of the classes; 2. Scores and separate parts for the concerts; 3. Books and music for the instruction of the pupils and for reference. The advanced pupils may borrow library books with the permission of the director, the same being registered, and for not longer than a month.

In the month of May the Director commences his examination of all the students in the Conservatoire, in the presence of the professors in charge of each class. He ascertains the progress made in the year, and how far each pupil has advanced in his education. These examinations, which take place daily, last about six weeks. On the result of these examinations, the Director determines the dismissal of those pupils who have done nothing during the year. This, however, is rare, for there is a great amount of emulation in the school among the students. The Director also determines from among the students those who shall be admitted to the competitions. The Director examines all the pupils twice a year, and makes a report to the Commission. Each professor and teacher makes a report of the pupils in his class.

The competitive examinations for prizes take place annually in the last week in July, and first week in August. After receiving the reports from the professors, the Director admits the pupils for competition, and those who are to accompany the solos and conduct the classes. The competitions in harmony and solfeggio are conducted with closed doors. Those for instruments and singing, in public. A jury of five or seven members is appointed by the Commission to award the prizes, of which the Director is President. The prizes are given by a majority of votes. In case of an equal number of votes, the Director has a second vote.

The names of the successful candidates are published in the newspapers. Each candidate plays or sings one piece at sight, and one which has been previously studied.

The prizes, of which the value is annually fixed by the Commission, consist of scores and works on the theory and history of music, collections of music for pianoforte, voice and solfeggio; and to the instrumental pupils bow and wind instruments. The prize-holders receive with the prizes a laurel crown and a certificate. The accessits receive a palm. The distribution of prizes takes place if possible in the month after the beginning of the academical year. It is followed by a concert, in which the pupils who have obtained the first prizes are permitted to perform solos.

The pupils who obtain the first prizes for their instrumental performances, their singing, for their performance on the organ, or for composition, are artists whose education is considered complete, and their studies finished. The term usually required to turn out an artist of talent complete, comprising a knowledge of composition, is about eight years. Each pupil gets about six hours of teaching in a week.

Concerts are given by the professors and pupils of the Conservatoire. The Commission fix the number with the Director who arranges the days and the programme, and at the beginning of each academical year he publishes in the school a list of the professors and pupils who are to take part in the orchestra and chorus at the concerts. Tickets for the concerts are sold, and the proceeds distributed among the most distinguished scholars.

The Town Councils of the provincial towns are in the habit of paying the expenses of promising pupils, *i.e.*, of those who obtain the first prizes at the Académies des

Beaux Arts in those towns, in order to enable them to follow the classes at Brussels or Liège.

There are annually two vacations from Palm Sunday to the First Sunday after Easter, and from the 15th of August to the 1st of October.

In the Brussels Academy there are for

	Professors.	Pupils.
Reading Music	5	85
Solfeggio	3 male. 3 female.	104
Bassoon	1	6
Flute	1	5
Cornet	1	10
Trombone	1	7
French Horn	1	6
Trumpet	1	4
Hautboy	1	9
Clarinet	2	6
Violin	5	69
Violoncello	2	25
Double Bass	1	4
Pianoforte	4 male. 3 female.	114
Singing	2	34
Italian Language	1	14
Organ	1	16
Declamation	1	20
Counterpoint	1	19
Harmony*	1	42
Practical Harmony*	1	19
Accompaniment*	1	11
	44	629

The actual number of pupils in the Academy for the present year is 564.

The Conservatoire is supported as follows:—

	Francs.
Subsidy from the State	15,540
,, ,, Town of Brussels	20,000
,, ,, Province	4,500
Fees from Foreign Students	2,500
	42,540

The expenditure is as follows:—

General Expenses.

	Francs.
Rent	6,200
Music, &c., and books	3,100
Pianofortes, furniture, and general maintenance of the establishment	7,120
Total	16,420

Expenses of Tuition.

Director	8,000
Secretary	1,700
Superintendent of studies	1,380
Two inspectors of ditto	2,440
Accompanyist	740
Tuner	200
Porter	180
Organ blower	150
28 Professors from 3,000 to 1,170	53,190
6 Sub-Professors from 950 to 600	4,500
8 Répétiteurs at 370, 2 ditto at 300, 2 ditto at 400	3,620
Total	76,100

The Director has a private residence in the building of the Conservatoire. The rooms for conducting the teaching of the Conservatoire consist of ten class-rooms and a large room in which the organ is placed. In it al the smaller concerts are given, the larger concerts a the competitive examinations taking place in the Pal Ducal.

The building appropriated to the Conservatoire is ancient character and forms a quadrangle, with a gard in the centre. It was formerly the residence of a nob man, and has been purchased either by the Governme or the City of Brussels for the use of the Conservatoi The arms of the former owners may be seen affixed the building.

* Two Courses.

Liège.

Whilst in Brussels, though not specially directed make inquiries as to the Conservatoire at Liège, I to advantage of an opportunity which occurred of taining the following information respecting that esta lishment:—

The Conservatoire at Liège is governed by a Rég ment from the king, upon the same principles as that Brussels.

There is a Commission of seven members, not includi the Director, but including the secretary. There i treasurer and a librarian besides; the latter registers attendance at the classes.

The instruction consists of

1. Musical reading and solfeggio.
2. Singing, individual and collective.
3. Instruments, bow, wind, and keyed.
4. Harmony and accompaniment from a figured bas
5. Counterpoint, fugue, and composition.

There is also a course of Italian and Latin pronunci tion and of French declamation.

All persons intended for the profession have a right the benefits of the Conservatoire gratis; but amate must pay 80fr. per annum.

There are scholarships for those who have a decid talent for music, and who can prove that they have n the means of continuing their musical studies witho assistance.

The inhabitants of the town have no advantage ov strangers.

The Conservatoire is supported by Government, b the town gives a subsidy.

The pupils have two lessons a week. Each profes has to attend twice a week for three hours at a tin and this has to be divided equally between all t pupils in his class, but the number may not exce twelve.

The report from M. Soubre, the director, states t the number of pupils on his accession to office in 18 was 258, and in the year 1862-3 reached 498. He c siders great benefit to have been derived from the est lishment of six extra classes for concerted music, for the organ, and one for declamation. Four conc were given, in which there were about 220 executa including 74 instrumentalists.

In 1863, the ordinary receipts were:—

	Fr
Subsidy from the State	30,
,, ,, ,, Province	4,
,, ,, ,, Town	13,
Produce of the fees	2,
	49,
Extra receipts	2,

The expenses were:—

	Fr
Director	6,
25 Professors and several aggrégés (1,200)	36,
Employés, prizes, library, warming, lighting, &c.	7
	49,
Extra for instruments, furniture, &c.	2

Programme of Studies in the Conservatoire at Liege.

	No. of Pupils.
1. *Class for Composition.*—Study of double counterpoint and fugue, composition for symphony, dramatic, religious, and so called chamber music. Analysis of best works of each class. Books; Courses of counterpoint and fugue by Cherubini and Fétis.	9
2. *Class for Harmony (male).*—Study of harmony, theory and practice; exercises written for four voices, four instruments, and pianoforte. Books; Treatise on Harmony, by Catel. On the Theory of Harmony, by Fétis.	22
3. *Course of Practical Harmony (female).*—Studies on the Pianoforte from the "Partimenti" of Fenaroli. Practical Harmony, by Samuel. The pupils are practised in playing on the Pianoforte at sight from score.	12
4. *Class for Bow Instruments and Piano.*—Study of duetts, trios, quartetts, and quintetts, by Haydn, Mozart, Beethoven, Schubert, Mendelssohn, and Schumann.	17
5. *Class for Bow Instruments.*—Study of trios, quartetts, quintetts, &c., by Haydn, Mozart, Beethoven, and Mendelssohn.	17
6. *Class for Wind Instruments.*—Study of trios. quartetts, quintetts, &c., by Mozart, Beethoven, and Reicha.	12
7. *Class for Concerted Singing (female).*—Study of oratorios, dramatic pieces, religious music, Handel, Haydn, Beethoven, Mendelssohn, Weber, Cherubini, Schumann, &c.	55
8. *Class for Concerted Singing.*—Boys and men. The same works as Class 7	83
9. *Orchestral Practice.*—Symphonies and overtures of Haydn, Mozart, Beethoven, Mendelssohn, Weber, and Cherubini	28
10 to 14. *Classes for Solfeggio (in nine sections).*—Elementary study of the intervals. Reading and dictation from the methods of the Conservatoire of Paris, the solfeggi of Italy, and the elementary solfeggi by M. Soubre. The upper department practises change of clefs, and further study of the theory of music	176
15 and 16. *Singing Classes for Men.*—Study of vocalisation, dramatic and religious pieces. Methods of the Conservatoire of Paris and Manuel Garcia; vocal studies by Crescentini, Bordogni, and Masset	23
17 and 18. *Singing Classes (Female).*—Same studies	23
19 to 22. *Classes for Pianoforte for Young Pupils.*—Gradual studies up to the execution of the works of Hummel, Weber, Beethoven, Mendelssohn, Chopin, Listz, &c. Methods of Adam, Kalkbrenner and Fétis. Encyclopædia of the Pianoforte by Zimmerman ..	41
23 to 29. *Classes for Pianoforte (Male).*—Same studies	70
30 to 34. *Classes for Violin.*—From the beginning to the execution of concertos by Viotti, Rode, Kreutzer, De Beriot, Vieuxtemps, Ferdinand David. .Methods of Baillot and De Beriot	41
35. *Class for Violoncello.*—From the beginning to the practice of the works of Romberg, Molique, Servais, &c. Methods of Romberg, Baudiot, Dotzauer, &c.	7
36. *Class for Double Bass.*—From the beginning to the practice of the concertinos by Labro. Methods of Labro, Bernier, and Wenceslas Hause	5
37. *Class for the Organ.*—From elementary playing to the practice of the fugues of Bach; sonatas by Mendelssohn. Study of the accompaniment of the plain chant..............	8
38 and 39. *Classes for Declamation.*—Exercises in articulation; reading aloud from select works; dramatic exercises	22
40. *Class for the Flute.*—System of Walkiers....	11
41. *Hautboy Class.*—Methods of Sellner and Brod	5
42. *Clarinet Class.*—Methods of Lefèvre, Beer, and Muller	8
43. *Bassoon Class.*—Methods of Ozi and De Willent	6
44. *French Horn Class.*—Method of Gallay	7
45 and 46.—*Classes for the Trumpet and Cornet-a-Piston.*—Methods of Schiltz and Forestier	21
47 and 48.—*Classes for the Trombone and Tuba.*—Method of Schiltz	14
Total............	743

In the classes from No. 40 elementary instruction is included, as well as the most advanced.

The chair having been taken by Sir John Harington,

Henry Cole, Esq., C.B., examined by the Committee.

415. You are Secretary of the Science and Art Department at South Kensington?—I am.

416. And have been so since 1852?—Yes. I have held that office, more or less modified by circumstances.

417. You have the permission of the Lord President of Council to give the committee information respecting Art-Education and its analogy with musical education in this country?—I thought it right to ask for official sanction to my giving evidence before this committee, so far as the working of the Art Department at South Kensington is concerned, and Lord Granville acceded to my request. But I desire it to be distinctly understood that the evidence I give is not official, but entirely personal. I have no right to speak in any respect as Lord Granville's officer; I only wish to point out how that information I conceive might usefully serve any academy of music; and it is on that ground alone I am now before you. I must repeat that any suggestions I may make or anything I may state upon facts which have been published in various reports—anything, in fact, I may state must be considered as stated entirely on my own responsibility.

418. You desire to speak more particularly with regard to musical education? Have you arrived at any opinion as to the general features of musical education in the country?—Music is not connected with and is no part of the business of the Science and Art Department. It may in one sense be said to be promoted by the Committee of Council on Education, who give Parliamentary aid towards the teaching of music in the various training schools which exist for the purpose of training teachers for general education throughout the country. I have formed opinions of my own on the subject of encouraging music in this country; but before I state them I should like to point out some analogies which I think will be found to exist between the Art-Training School at Kensington and any future academy of music. That Art-Training School is essentially supported by the state. It is a public institution. In early times—as much as twenty years ago—the School of Design, which was the foundation of the Art-Training School, might be said to be supported by the state to the extent, I think, of between £3,000 and £4,000 per annum. In 1852 it was decided to alter the character of the School of Design then established, and Mr. Labouchere (afterwards Lord Taunton) held the office of President of the Board of Trade. At that time, when the change was projected, students were taught simply to assist manufacturers, but without the intention of their giving instruction to others. The School of Design was then changed into a school for training teachers, still allowing the public to enter and pay fees. The result has been that some 200 or 300 persons during the last twenty years have been trained as art teachers, who have

been trained at an average expense to the public, I think, of about £200 each.

419. During how many years?—Since about the year 1853.

420. What does that £200 represent?—It represents all the expenses of educating and maintaining a student for over about two years. Roughly speaking, in about these proportions:—About £50 a-year to the student for his maintenance, and about the same sum for his instruction. Broadly speaking, I think each student trained has cost the state £200 to produce. There are nearly 100 Art Schools throughout the country, to which teachers go as masters. I apprehend there would be quite as many places where pupils would be glad to learn music if they could find competent teachers. I think it is already in evidence before the committee that a considerable number of those trained at the Royal Academy of music are located in various parts of the country as professors of music, who have not risen to such an eminence as qualifies them for public performances, but who, notwithstanding, impart good, sound musical education throughout the country. It is my own opinion that the state would do well to have something analogous for music. I am not prepared to say that any Academy of music should be founded hereafter expressly as a training school only for teachers of music, but I believe teachers of music could well come out of it. I think there is this distinction between drawing and music—that drawing is encouraged by the state because it is useful to individuals in industrial occupations; manufactures are improved by the artisan having a knowledge of drawing; but I think music is to be encouraged in order not that any special class, but that the country at large may derive benefit and pleasure from it. It seems to me that it is the business of some central institution—say the Government—to take care that the musical talent of the country is not wasted and lost. In bringing forward this analogy to Art Schools I do not insist that an Academy of music should be only a training school for teachers. I guard myself against that; but I think it should educe musical talent, which would become distinguished either as performers or teachers: and as almost all civilised governments of the world have thought it good state policy to devote some portion of their revenues to the encouragement of musical education, so I think the time is come when our own government may be fairly asked to do the same without stepping beyond its functions.

420. Is your reason for wishing the government to interfere in this matter that you consider the system of musical education has not been conducted on a sufficiently wide basis to secure the enlistment of all the musical talent of the country?—I am quite of that opinion. I feel, moreover, that it is absolutely necessary to have some kind of responsible central authority for the perfection of any institution of this kind, and such responsible authority can be best furnished by parliament. Music seems to me not to stand on the usual principles of political economy, like the supply and demand of an article which is in everybody's hands. It is nobody's interest, except from motives of benevolence, to train a fine voice. The parents possibly may be the very poorest; the voice may happen to belong to those who cannot pay for its proper teaching; and it seems to me that to let it take its chance in a haphazard way is really throwing away, I may say, the gifts of Heaven. A fine voice ought to be looked after and cherished. It is not a question that can be looked at from the *laissez faire* or the mere breeches-pocket point of view.

421. Have you arranged any system which you would suggest should be followed for the foundation of a general institution of musical education?—I have; but here again I must premise that whatever I may state is done on my own responsibility. Although I have ventured to conceive a musical academy existing in this country as good as in any other capital of Europe, I have no authority for saying the thing could be carried out as I propose. At the same time, if I did not believe my plan had some soundness in it, I should not state it to the committee; but I beg it to be understood that I have not the slightest authority for proposing it, and the plan will stand just for what it is worth, and go to limbo if worth nothing. I will lay before the committee a set of propositions which I venture to submit as worthy of their consideration and discussion. Proposal No. 1 is as follows:—

I. That it is expedient that the United Kingdom should have a musical academy as a national institution, on a scale of efficiency equal to the best in other capitals of Europe.

422. What would you define as the object of an academy of music?—To collect together from all parts of the United Kingdom those persons who have musical talent which it is important to cultivate,—primarily, to sing and play in public; secondarily, to teach. To give such instruction that the proficients would be available in either capacity. It is well known that those who have attained the greatest proficiency, whether as singers or instrumentalists, are, in most cases, teachers to a certain extent. There should be nothing in the academy to prevent any one going there with the object of becoming a teacher only. Some departments of the academy would include teaching only; others would combine performance and teaching together; others performance only.

II. That at such an academy a limited number of young persons of both sexes who give promise of great musical ability should receive gratuitously a complete musical education, whilst others should be partially assisted, and others should pay remunerative fees.

III. That the two first classes of students should be obtained by a competition carried out in all parts of the United Kingdom, and culminating in its action in the metropolis, where the academy would be established; by which system the academy would be brought into useful relation with all local institutions promoting music, such as cathedral choirs, diocesan and other choral societies, and other musical institutions.

422.*As to selection by competitive examination, do you consider there would be any material difference in the facilities with which examinations could be carried on in drawing and music?—I think little or none. The present mode of action in examining in drawing and in science is two-fold. It is either to send down an inspector to a school of art, or to cause the examination to be carried out by the local authorities themselves. The former plan was adopted some years ago, but the latter is now coming more into use. In the case of science, the whole of the examinations are conducted locally as far as students are concerned. They are conducted centrally so far as the examination for teachers is concerned. I should propose, in reference to music, that various local universities, societies, choirs, and others, which might be disposed to come into communication and union with the academy of music, should themselves conduct an examination of their own annually, according to rules mutually agreed on. They would be able to judge if among the persons examined there were any good voices or great musical aptitudes. I would then propose that the academy itself should hold examinations in three or four centres throughout the country. We have an examination for science in the Metropolis, also in Dublin, and one in Edinburgh, and one in Manchester in order that persons may come up to those centres to be examined as teachers. If they succeed and get certificates, the department pays their expenses. If they fail, they have run the risk, and their expenses are not paid. I apprehend something like that plan might be carried out, with the necessary modifications, for music. Perhaps it could be carried still further; after having got these local examinations done, those persons who had obtained certificates might be brought up for competition for admission

to the academy. In this case I would propose, if they came up duly certified from the various localities, that the Academy of Music should be at the expense of their coming up for trial. I attach considerable importance to providing adequate facilities for bringing qualified students up from even the remotest parts of the United Kingdom; but I would not have the academy exposed to the risk of the expenses without some preliminary investigation, which, I conceive, could be conducted by local authorities.

423. You would have a committee or board of examiners in London of the same class as you wish to establish in the country, by whom certificates would be given to such as were considered qualified to be submitted for the final examination for the Royal Academy?—Just so. The 4th proposition is as follows:—

IV. That it is expedient that the revenue of such an academy should be obtained from the following sources:—

- a. An annual parliamentary vote sufficient to endow a limited number of free and partially free scholarships, say eighty.
- b. The fees of students, the numbers being limited by the accommodation.
- c. Annual subscriptions and endowments from members.

425. Without being precise as to the sum, could you give the committee any idea of the amount you would require under these several heads of *a*, *b*, and *c*?—My present impression is—assuming a building to be provided rent free—the academy would cost about £12,000 a-year. I should hope to get in the beginning at least £8,000 a-year from the state for scholarships, £2,000 a-year from the students' fees, and £2,000 a-year from subscriptions. Of course all this is subject to modification; but I think a practical plan could be carried out upon that basis of receipts.

426. Have you anything to say on the subject of fees paid by students?—Yes. A good deal, either at this stage, or at a future one, when I speak about the site.

427. You mean, of course, that the vote to the Academy should be an annual one.—Just so. Proposal No. 5 is:—

V. That the parliamentary vote should be obtained through and expended subject to the approval of the Committee of Council on Education, who would represent the Government.

I may say that my opinion on this point is, that if you wish to obtain any large sum of money from Parliament, Parliament will insist upon having some responsible mode of looking after the expenditure of it.

428. Have you anything to say with regard to the site for a Royal Academy of Music?—Yes. I believe the Royal Academy of Music did wisely in the year 1853 in asking for a site at Kensington. I believe greater facilities exist there for building a Royal Academy of Music of adequate size and character than anywhere else.

429. Might it not be objected that the situation is not sufficiently central?—I do not know what is central in this vast metropolis, except Smithfield! With reference to the convenience of Kensington, the facts which I can give the committee speak for themselves. As regards the term "central," I do not see that it has much to do with the matter of convenience or attraction. Nobody wants to live in Smithfield or to go there because it is central.

430. Do you consider the pupils should be lodged in the Academy or in the environs of the Academy?—My own opinion is that there ought to be no pupils lodged in the Academy, and I consider it preferable to adopt the Scotch system of requiring the parents of the students to make their own arrangements, as at present is done with the art students.

431. The question is as regards a central situation in respect to the convenience of the students and teachers?—I will answer that question by referring to facts relating to the Art Training-school. When the drawing classes were at Marlborough-house, it was thought by some that the fortunes of that school would be damaged by taking it to South Kensington. That theory was involved in the question of centrality. In Oct., 1853, the fees paid by the public who attended the Art School at Marlborough-house, with whom it was entirely optional whether they attended or not—the fees received from pupils that session amounted to only £262.

432. At Marlborough House?—Yes, at Marlborough-house. The fees received at South Kensington for the October session of 1864 amounted to £950, or more than threefold those they amounted to in the last session in which the school was carried on at Marlborough-house. There is no doubt that wherever a good thing is to be had people will go there for it; and if you give convenience and an article of high quality the public appreciate it sufficiently, and do not grumble at having to go for it. You have a proof of that in the Crystal Palace. Multitudes flock there because it is attractive; and though they have to pay a shilling admission, besides the railway fare, to spend the day there, and working men have to sacrifice a portion of their earnings, yet more people go to the Crystal Palace than to the free public institutions which are nearer the centre of London.

433. Do you consider the site at Kensington would be generally convenient to the musical professors and teachers?—I have no doubt whatever it would be quite as convenient to the majority as the present site in Hanover-square. It would have advantages of its own; but as a question of distance and convenience of access I think it would have decided advantages over the present site. The site I have in my eye would be within a few paces of a railway station connected with the circular district railway of London, and I am told that the distance between Charing-cross and Kensington will be accomplished in seven minutes, and passengers to Kensington would be landed there every five minutes in the day. I think if you take a professor living out wherever you like—Finchley-road, Highgate, Islington, Tyburnia, Belgravia, or any other place, with this railway in operation, the site is not a matter of very much consequence. The academy would be easily reached by means of this railway, which tends to make the site practically "central" for almost all persons except those living close to Hanover-square.

434. There would be other stations than Charing-cross?—Yes, numerous—east, west, north, and south. Members of Parliament are to be carried from Kensington and landed at the Victoria Tower in five minutes. The railway I am speaking of is not a mere project, but is at this moment in actual course of construction; and I am told the station at Kensington will be ready for occupation in eighteen months from this time.

435. Have you any suggestions to make with regard to the exact site you propose?—In the year 1853 the Royal Academy of Music made an application to the Royal Commissioners of the Exhibition of 1851 for a site on their estate, and I believe that proposition was favourably received by the Commissioners. It was at that time, I believe, contemplated it should be on the north side, facing Hyde-park. I agree with what appeared to be the opinion of the Royal Academy at that time. I think it could be favourably placed in the Kensington-road.

436. Is not that one of the most favourable sites in London if the question of Kensington is entertained?—It is facing Hyde-park, which is considered to be the cream of situations. It has great picturesqueness about it. It stands 50 feet above the level of the river; is on a gravelly soil; it is also on a direct road from London; and I believe the ground rents there fetch a higher price than at almost any similar place; all of which seem to be reasons in favour of that site.

437. Have you heard the value of that site,—that it has been put at a minimum of £5 and a maximum of £9 per foot per annum?—Yes, I have; so that if money's-worth affects the question of site that is certainly in its favour.

438. So that 30 years' purchase would represent a sum of £150 or £200 per foot for the freehold. You take it for granted the site in question is to be obtained gratuitously?—Yes, I take that for granted. I think that is to be inferred from the correspondence which is already before the Committee. I now come to proposal No. 6, which is as follows:—

VI. That there should be a board of non-professional directors, who should nominate the Principal and all officers for the approval of the Lord President of the Committee of Council on Education, through whom an annual report should be made to Parliament.

On this point I would say that I am not wedded to any particular theory of management, except a responsible individual executive, which I hold to be indispensable. I only throw out for consideration what appears to me would be likely to be practicable. My own private opinion is that the Royal Academy had better have a management of its own, and not be managed by a department of the Government:—that all the Government should have to do would be simply to pay the parliamentary vote, and see that the money is expended properly, and in accordance with the vote, and withhold it if not properly expended. Analogies for that course are to be found in the Royal Society of Dublin, which receives many thousands a year by parliamentary vote, and the Government simply looks to the proper expenditure of the money. The Zoological Gardens of Dublin are another instance; the London University is another; the universities of Oxford and Cambridge are others. They all receive parliamentary votes. The Royal Society gets £1,000 a year; but Government does not interfere with the internal arrangement; so that there are ample precedents.

439. And Government does not even exact a report?—Government does not exact a report from some of them, but I think an annual report is a wholesome thing.

440. Do you think it advisable that the directors should be entirely non-professional?—Yes, I do. I think non-professional directors will represent virtually the money of the subscribers and paying students. I think the success of the institution would depend mainly upon a proper division of the functions of the management. I would leave the responsibilities of the teaching entirely in professional hands; but I would leave the direction of all business affairs in the hands of laymen. I think there is an important distinction between what we may call the common sense and the technical points of management. Proposal No. 7 is as follows:—

VII. That the subscribers should pass bye-laws for the government of the Academy, should elect the board of directors, and enjoy privileges of admission to the concerts, &c.

I apprehend if the Academy revives, as I hope it will, its concerts and performances, they will be matters of attraction sufficient to induce subscribers from all parts of the country to pay their two or three guineas a year, who will thus get their money's-worth for their subscriptions. I also think the subscribers should form the constituency for electing the lay-managers. I do not wish to express any harsh opinion upon the Academy in its present state; but I feel bound to say I think there is little life in it. I do not think the public at large feel interest in the present Academy. There are a few philanthropic persons who have from time immemorial subscribed to it, and who go on subscribing still; but they have little or no voice in the management, except, perhaps, in a very indirect manner, and, therefore, they take no great interest in it.

441. You think the general public should be induced to take an interest in it?—I think that is essential to its success, certainly. Proposal No. 8 is:—

VIII. That the professional management of the Academy should be placed under the control of a professor, who should combine great administrative ability with a high professional position. Such a director should receive an income, partly derived from fees, of not less than [£] a year with a residence, giving whatever time and attention may be necessary for the success of the institution.

With regard to this I would say I think we should have directing an Academy such as this country ought to possess, men of equal eminence to those who preside over the academies abroad. I think they should be sufficiently and liberally paid for their services, and I do not think an institution of this kind will succeed unless that is done. Having provided the best men you can, and paying them liberally, you have a right to exact from them the best possible management.

442. It is to be inferred that you propose the director of the Academy should receive a liberal salary?—I do; as liberal as possible. No. 9:—

IX. That new premises, having a theatre, proper class rooms, etc., should be provided.

443. How do you propose that the funds should be raised for this purpose?—By every conceivable legitimate process. As it is assumed that the site would be granted gratuitously, we might expect to get donations from the public. We might, perhaps, get donations from societies who wish well to this one. I can just conceive it possible that the Institution which has started this inquiry might come in aid; and it is not beyond my dream of possibility that other corporations might come in aid also; but all this is matter of detail after the general plan has been matured.

444. You think your proposals involve no insuperable difficulties?—I certainly think not. It seems to me there is so large a public (which is on the increase) who desire to promote music and to enjoy it, that I do think if proper means are taken, we may look forward confidently to getting sufficient funds to erect proper premises once and for all. Proposal No. 10 is—

X. That as these objects are compatible with the present charter of the Royal Academy of Music, it would be more desirable to enlarge the action of the present Royal Academy of Music, with the concurrence of all concerned, than attempt to form a new institution in opposition to it.

445. Have you reason to suppose that the Royal Academy, as a body, would come into this scheme?—Yes; I think there is fair reason for supposing that the Royal Academy will march with the times. We have had the evidence of Sir G. Clerk, one of the prime movers in and one of the staunchest friends of the Academy, and we may conclude from his evidence that he is favourable to some such plan as I have now laid before the committee. I think almost all the other witnesses have exhibited good-will towards the Academy, and when they have animadverted upon it they have done so with reluctance and hesitation. In drawing up these proposals I think it right to say that the opinion of Sir George Clerk upon them is conveyed in the following extract of a letter received from him only last month, in which he writes:—"I have very little doubt that every person connected with the present Academy will be rejoiced if the musical education of talented young persons could be placed on the footing you propose." So that I think we may conclude the Academy itself would not be unwilling. I think having an academy with a Royal Charter, with the Queen as its patron, and many noblemen connected with it, it would be an ungracious act to attempt entirely to supersede the present institution until its revival was entirely hopeless. I for one should not be disposed to take any part adverse to the Royal Academy of Music, and I have no reason to doubt that they would willingly accede to any changes in the system that may be deemed desirable for promoting the increased efficiency of such an institution.

446. If there is any present hostility towards the Academy do you think a scheme such as you have now laid before the committee would be calculated to remove it?—I have no doubt of it. I hope on a future occasion

to hear my views on this subject corroborated by persons interested in other institutions of like character to this.

447. Your plan involves no necessity for a fresh charter?—I apprehend a plan of this kind could be carried out without rendering a new charter absolutely necessary. Still, supposing the thing to be recognised on a good basis, there would be no practical difficulty, I apprehend, in obtaining a new charter if it were necessary to do so.

In reply to the committee on the subject of the character of theatre proposed, Mr. Cole stated that in all the foreign conservatoires of music great stress was laid upon making persons good declaimers; and as operatic music was now very largely engaged in, he proposed that a theatre with a moderate and only just sufficient amount of scenic aid should be provided to assist the practice of that class of music, especially in the practice of singing. He considered this necessary for a complete musical education, and in the reorganization of the institution his desire was that the work should be carried out with the utmost amount of efficiency and with thorough completeness in every department, but he hesitated to discuss at the moment such matters of detail.

The committee then adjourned.

INTERNATIONAL HORTICULTURAL EXHIBITION AND CONGRESS, 1866.

A general outline of this undertaking was given in the last *Journal*. The attention of students in drawing at the Institutions and Evening Classes in Union with the Society of Arts is now especially drawn to the following prizes offered for botanical drawings:—

"(237.) Water-colour drawing of any plant, British or exotic, natural size, with the usual magnified dissections; to be drawn or mounted on folio paper, and to combine scientific accuracy with artistic treatment. 1st prize, £5; 2nd prize, £3; 3rd prize, £2."

Candidates will observe that these drawings must be sent to the executive committee at the Royal Horticultural Gardens, South Kensington, by the evening of Monday, the 21st of May. Further particulars may be obtained on application to the assistant-secretary, Mr. Richard Dean, 1 William-street, Albert-gate, W.

PARIS IMPROVEMENTS.

The expenditure of the City of Paris, apart from that of the State, for works of public utility during the present year is given officially at two hundred millions of francs, or eight millions sterling. The application of this sum is as follows:—

	£
Public promenades and plantations	1,280,000
Water supply and sewers	1,320,000
Religious edifices, hospitals, municipal buildings, and public schools	2,400,000
Road work	3,000,000
	£8,000,000

Of all the public works the sewers are beyond question the most important and the most difficult of execution, and the progress which has been made during the last few years, not only in the extension but in the improvement of the system of these great outlets of impurity is one of the most important facts in the history of Paris. It appears that in the year 1800, the total length of all sewers of the city was 15,386 mètres. The additions made since are as follows:—

	Mètres.
From 1800 to 1831 there were constructed new sewers equal in extent to	20,124
1832 to 1839	50,870
1840 to 1847	27,804
1848 to 1849	5,925
1850 to 1855	21,738
In 1856	3,528
1857	10,999
1858	4,436
1859	18,383
1860	19,944
1861	20,079
1862	30,057
1863	30,682
1864	39,227
In addition to the above, the branches for the service of private establishments amount to	16,559

The whole amounting to 388,451 mètres, or more than two hundred and thirty miles in length.

Another new public garden is about to be formed, in the fourteenth arrondissement of the city. The site selected is the plateau of Montsouris, an elevated spot commanding the valley of La Bièvre and affording a fine view of Paris and the surrounding country. The Parc of Montsouris will be connected with the main boulevards of the city by a road forty mètres wide, to be called the Boulevard Jourdan, and will be approached from other quarters by four other roads, two of twelve and two of twenty-two mètres in width. The new parc will cover an extent equal to nearly forty acres; the parc of the Buttes Chaumont now in course of formation covers fifty acres, the Bois de Boulogne and the Bois de Vincennes are respectively 3,000 and 3,100 acres in extent.

Immense works are now under hand with the special view to the improvement of the approaches to the Exhibition of 1867. The whole of the steep hill known as the Trocadéro, and which extends from the old village of Chaillot to Passy, is being cut down, and three new Boulevards will shortly pierce this hitherto inconvenient suburb, and connect it directly with the river and the Champs Elysées. The enormous quantity of rubbish supplied by these works is being carted to the Champ de Mars to form a foundation for the new Exhibition building. In connection with this great work may be mentioned the widening of the Bridge of Jena, which will correspond with the main axis of the Exhibition building; the pathways are to be added to the roadway, and new footways constructed on each side of the bridge. Opposite this bridge, on the side of the Champs Elysées, will be a fine open space called the Place Josephine, and in which will stand the statue of that Empress. There are six churches at the present moment under construction, two large structures, both nearly finished, in the heart of the city, and four in the outskirts.

Next to the new series of sewers, and infinitely more open to public appreciation, the new markets will probably be the most striking works which the municipal government of Paris will have to show the world in 1867. The great central halles, or market, with its broad streets all under cover, (which has already been described in the *Journal*,) is rapidly approaching completion, and will be certainly the finest establishment of the kind in the world; the market of the Temple and that of St. Honoré, situated in the very heart of the city, have been entirely reconstructed, four or five others have been greatly improved, and six new markets, to replace those which have been demolished, are now being erected in the same style as that of the great central market, that is to say, on columns of cast iron, supporting lofty, well-lighted, and well-ventilated roofs formed of iron, zinc, and glass, with extensive cellars for the storage of stock and materials, and supplied with water and drainage in the most complete manner. Two other new markets are also under consideration, and by the time the great Exhibition opens there will probably not be a specimen left of those assemblages of dirty huts which formed the old markets and supplied refuges to myriads of rats, and so were many sinks of pestilence. Two of the six new markets now under construction, cover respectively areas of 2,000 and 2,700 square yards.

Fine Arts.

Exhibition of National Portraits.—The Galleries in which Lord Derby's great scheme, so historically suggestive, is soon to find its realization, are in rapid progress of completion at South Kensington. The galleries are perfectly dry. The arrangements to maintain a proper uniform temperature (excluding all fire from the premises), and for constant watch by the police, give every security that can be provided. They have a quiet look of fitness, both in their simple arrangement and decorative colouring, and are calculated to contain about 800 pictures, about the number of British Oil Paintings exhibited in 1862. It is stated that they will not fail to be adequately filled. On all hands there has been a hearty response; and many family treasures, which have never before left walls where they have hung for generations, have been placed at the disposal of the Committee. It has been proposed that the first year's Exhibition, which is to open in April next, should extend to the Revolution of 1688; it is believed that the number of fine portraits offered may perhaps compel the Committee to terminate the first year's exhibition with the portraits of the Commonwealth.

Exhibition of French Art in New York.—An arrangement has been made for an exhibition of the works of French artists in New York, and the *Moniteur des Arts* of Paris says that M. Cadart, one of the editors of the *Société des Aquafortistes*, will leave in a few days for America to organize the exhibition, which is to open in March. He takes with him about two hundred pictures, by the best living artists of France, and representing the school in all its phases. The idea is certainly a good one, and, if well carried out, is likely to furnish French artists with a new and important market for their works.

Commerce.

Cotton in Italy.—At a recent meeting of the Cotton Supply Association, a letter was read from Naples enclosing samples of Sea Island, Siamese, and New Orleans cotton, twelve bales of which, the produce of about fifty-eight acres of land, amounting to 7,130lbs., had been shipped for Liverpool. The soil in which it was grown is composed of a very thick strata of ashes from Vesuvius, on a rock of lava from the same volcano, which runs down to the sea. The property was formerly entirely covered with vineyards, but since the disease in the vines made its appearance no vintage worth preserving has been obtained, and a portion of the estate has been converted into arable land for growing madder roots and cotton. The Sea Island variety seems to thrive well, and should fine weather continue until the end of the year it is expected that the plants will produce two or three bales more of clean cotton. The yield this year has not been so large per acre as last year, a violent gale of wind between the 9th and 12th November having damaged the plantations considerably. The cotton was picked as it ripened during the months of September, October, and November, care being taken to keep all the defective cotton separate from the good. It was cleaned by Macarthy gins, worked by steam power, and every effort has been made to send the cotton to market in the best possible condition. It is very difficult to ascertain the quantity grown or the extent of land cultivated with cotton in the neighbourhood of Naples, or in the other provinces. The greater part is shipped for Genoa, Marseilles, and Trieste, whence it finds its way to the north of Italy, Switzerland, and Germany, very little indeed being shipped to Great Britain.

Speculation in Petroleum.—During the petroleum mania in America 1,100 oil companies were started, with an aggregate par capital of 600,000,000 dols. It is estimated that 15 per cent. of that amount has been actually paid up, giving an aggregate of real investment of say, 90,000,000 dols. The production of the present year may reach about one and a-half million barrels. The exports have usually averaged about 37 per cent. of the entire production. The average price at the well is 10 dols. per barrel, thus making 15,000,000 dols. as the value of the year's production. Deducting 20 per cent. for company and working expenses, this yield would leave 13⅓ per cent. upon the estimated 90,000,000 dols. of actual invested capital, which, considering the risks and the uncertain duration of the oil wells, is not considered particularly remunerative.

Sugar Cultivation in the Sandwich Islands.—The *Panama Mercantile Chronicle* says that the cultivation of sugar seems to have been found extremely profitable in these islands, and to have made proportionate progress. The export, which was 3,005,504lbs. in 1862, advanced to 10,414,411lbs. in 1864. New plantations are being constantly started, and the shipments this year are expected to be far larger than the last, while the area of land still untouched by cultivation, but capable of profitably producing sugar, is supposed to be ten to twenty times the quantity now yielding. Under these circumstances, and looking at the other capabilities of the country, a belief is expressed that the importance of the Sandwich Islands has been much underrated, and that with a continuance of the Government and security now enjoyed, they will rapidly take rank as the West Indies of the North Pacific Ocean.

Colonies.

Australian Wine.—A South Australian journal speaks of the manufacture of colonial wine as having already become a very extensive business. Thousands of acres of vineyards have been planted in various parts of the colony. Great as is the present yield, there can be but little doubt that in a very few years it will be doubled. Vignerons still continue to plant more vines, and it has been proved that South Australia is admirably adapted by soil and atmospheric conditions for the growth of vines of a superior quality. Every variety of grape yet tried has done well in some part of the colony. There are, however, complaints in several quarters that a market can not be found for the large quantity of wines which are annually manufactured. It is said that there are thousands of gallons lying in the cellars of the makers which cannot be sold, and that this has become a serious inconvenience to persons who have invested capital and labour in the business. There appear to be various causes for this:—First of all, a great deal of very poor stuff has been made under the name of wine, which neither ought nor was likely to find a market. In the great majority of cases the manufacture of wine has been a tentative process. They who could grow a few acres of vines began without experience to make the produce into wine. The delicate manipulation which is necessary was very slowly learnt, and whilst gaining proficiency in the art by experience a considerable quantity of wretched stuff was made which could hardly be expected to sell. A prejudice was thus raised which it was difficult to remove. The art of wine-making has, however, wonderfully improved during the last few years, but now many of the most successful manufacturers put too high a price upon their good wines. It will be a long time before people drink colonial wine as they drink port or sherry. It is necessary, too, that all vexatious restrictions on the free sale of colonial wine should be removed by the colonial parliament. For any small increase to the revenue which wine licenses contribute, it is bad policy to place restrictions on the trade. It is exceedingly desirable, too, that some arrangements should be made, if possible, for the admission of colonial wines to the other colonies at a low duty. The hig

charges in Victoria at present are practically prohibitive. The time will probably come when a large central company will be established to take the sale out of the hands of the smaller growers, and by greater care in the manufacture, will produce several classes of wine which will have an individual character that can be maintained year by year. Until something of this kind be done, and wines can be regularly supplied having a marked individuality, the trade will never become what it ought to be. It is certainly not to be recommended that by "doctoring" these wines should be turned into middling imitations of port, sherry, claret, or burgundy, but that they should have a character of their own, which by careful management can be always maintained.

Obituary.

SIR CHARLES LOCK EASTLAKE, President of the Royal Academy, died at Pisa on the 23rd instant. He was the son of a solicitor of Plymouth, where he was born on the 17th November, 1793. He was educated at the Charterhouse, which he quitted at an early age for the purpose of pursuing his artistic studies. After the usual probation at the Royal Academy, under Fuseli, he painted a picture of "The Raising of Jairus's Daughter," purchased by the late Mr. Jeremiah Harman, by whom he was employed to make copies from celebrated pictures in the Louvre, an occupation which the return of the Emperor Napoleon from Elba, in 1815, compelled him to relinquish. On his return home he employed himself chiefly in portrait-painting in his native town, and on the arrival at Plymouth of the Bellerophon with Napoleon Bonaparte on board, he managed, from sketches made daily alongside, to paint a full length, life-size portrait of the ex-Emperor. After visiting France, Italy, and Greece from 1817 to 1820, he took up his abode at Rome, where he remained several years. He first exhibited in the Royal Academy in 1823, when he exhibited views of the Bridge and Castle of St. Angelo, the Coliseum, and St. Peter's. In 1827 Mr. Eastlake was elected an associate of the Royal Academy, and in the year ensuing he produced his "Pilgrims Arriving in Sight of Rome." During his residence at Rome he painted many pictures of cabinet size, of subjects connected with Roman banditti, contadini, &c. In 1830 he attained the rank of Royal Academician, and returned to England, when he abandoned his Italian costumed groups for a higher walk of art. He still continued, however, to illustrate Italian history, poetry, and manners; and his "Contadini and Family Returning from a Festa, prisoners to Banditti," a repetition of a similar subject painted by him in Rome, and "Escape of Francesco di Carrara and his Wife," must always rank among his most successful efforts. In a similar category may be classed several scenes of the Turco-Greek war, his "Greek Fugitives," his "Arab Selling his Captives," his "Gaston de Foix," &c. About this period he began to devote himself more especially to religious subjects, and his "Christ Blessing the Little Children," and "Christ Weeping over Jerusalem," and "Hagar and Ishmael," remind us, in sentiment, of some of the best works of Ary Scheffer, but are more agreeable in colour. The reputation attained by Mr. Eastlake, both as an artist and connoisseur, led to his appointment, in 1841, by Sir Robert Peel, to the office of Secretary to the Royal Commission of Fine Arts. In 1843 he was appointed Keeper of the National Gallery, but he resigned the office in 1847. In 1850, on the death of Sir M. A. Shee, he was elected President of the Royal Academy, and received the honour of knighthood. In 1855 Sir Charles Eastlake was appointed director of the National Gallery, under the new and greatly extended form of organisation, since which that institution has received numerous and valuable additions worthy of the *chefs d'œuvre* in the Angerstein collection gallery, which formed the basis of our national collection. His avocations, however, appear to have left him little leisure for art, and we have accordingly had but few pictures from his easel for some time past. Sir Charles Eastlake has made several valuable contributions to the literature of the Fine Arts, among which may be mentioned his translation of "Goethe on Colour," "Notes to Kugler's Handbook of Italian Painting," and "Contributions towards a History of Oil Painting." He was one of the trustees of the National Portrait Gallery, and also *ex officio* a trustee of the British Museum, a Knight of the Legion of Honour, and a Fellow of the Royal Society. Sir Charles Eastlake took great interest in the proceedings of the Society of Arts connected with artistic copyright, and acted as Chairman of the Society's Committee which succeeded in procuring the passing of the "Art Copyright Act, 1862."

Forthcoming Publications.

THE "ATLAS OF THE STORMS" of the year, executed by the Scientific Association of Paris, is reported to be nearly ready for publication; a number of the charts have been presented to the Academy of Sciences. The Atlas will contain sixty charts, engraved on copper, and printed in blue ink, and will be sold at cost price, namely, ten francs, but only to subscribers. The list closes at the end of the year.

A HISTORY OF THE MACHINE-WROUGHT HOSIERY AND LACE MANUFACTURES, by William Felkin, Esq., Nottingham, is preparing for publication. It will be in one vol. 8vo., of 500 to 600 pages, and will contain memoirs of the Rev. W. Lee, M.A.; John Heathcoat, Esq.; and others, with an account of their inventions.

Notes.

THE STOCKHOLM EXHIBITION.—The buildings erected for the Industrial Exhibition are in wood and glass, and originally covered a space of 70,000 square feet, but it was found that this space would be quite insufficient for the intended purpose, and the committee has determined to increase it to 100,000 or 120,000 feet. The productions of Sweden, Norway, Denmark, and Finland are generally the only ones to be admitted, but the central committee has been authorised to admit contributions from other countries, in case that space and circumstances permit. Several applications have, in consequence, been made, but the committee has deferred its decision till the first of January, 1866. It is understood that admission will only be granted in very special cases. An exhibition of works of fine art, of the Scandinavian schools, will take place at the same time as the other, in a new museum which is now building at Stockholm.

PROPERTY IN PRIZE MEDALS.—A case was tried the other day in the court of Lyons, respecting the proprietorship in prize medals, not only as regards the prize *per se*, but also with respect to the matter of which the medal is composed. The judges decided that the medals given, in the case of an agricultural competition, where honorary and purely personal distinctions, given in the way of encouragement and recompense, and with a view to the public interest, could not become an object of traffic or of transmission; further, that no distinction could be drawn between the honorary and the material value of a prize, that they could not be legally separated the one from the other. In other words, a prize medal is entirely personal and inalienable under any circumstances. Other cases have arisen in which the purchasers of animals whose breeders have been awarded prizes have, by permission of the latter, set up representations of the medals received, and have been

compelled, on the principles laid down by the court of Lyons, to discontinue the practice. Considering the great extension of the prize medal system in France, it is highly important that the use of such awards should be carefully prescribed.

The Chemical School at the Jardin des Plantes.—The Minister of Public Instruction having made an appeal for subscriptions in aid of the new public laboratories, established at the Jardin des Plantes, the Duc de Luynes, who has already made several munificent presents to the various public galleries of Paris, including a very fine collection of coins which has recently been set out in a special apartment in the Bibliothèque Imperiale, wrote to the Minister as follows:—"In reply to your appeal I can only send you 10,000 francs." The Duc de Luynes and de Chevreuse has been grievously afflicted, having lost his son, daughter, and grandchild, and seems to seek consolation in acts of enlightened generosity.

Water Supply of the Metropolis.—In 1850 the gross daily quantity of water supplied by the water companies of London was 44,383,332 gallons daily. In 1856 it had reached upwards of 81 million gallons per day, having nearly doubled in the short space of six years, and now, in 1865, it is about 108 million gallons. This is about 30 gallons per head per day on the present population.

To Correspondents.

Errata.—Mr. T. S. Burt has forwarded the following errors (most of which occurred in his M.S.) for correction:—Page 87, col. 2, line 29, for "would," read "could" twice in same line; line 30, for "constantly," read "consequently;" line 43, for "bow," read "stern; line 48, ditto; line 55, for "in advance," read "a-stern;" line 59, for "bow," read "stern;" line 61, ditto; page 88, col. 1, line 40, for "worn," read "nearer;" line 52, for "least," read "last;" col. 2, line 43, for "providing," read "provided;" line 44, for "a-head," read "a-stern;" line 45, for "descends," read "depends;" for "bow," read "stern;" line 57, take out comma after "to take place."

MEETINGS FOR THE ENSUING WEEK.

Mon. ... Entomological, 7.
Tues.... Pathological, 8. Annual Meeting.
Anthropological, 4. Annual Meeting.
Geologists' Association, 6½. Annual Meeting.
Royal Inst., 3. Professor Tyndall, F.R.S., "On Sound." (Juvenile Lectures.)
Wed.... Pharmaceutical, 8.
Thurs.. Royal Inst., 3. Professor Tyndall, F.R.S., "On Sound." (Juvenile Lectures.)
Fri...... Philological, 8.
Sat. ...Royal Inst., 3. Professor Tyndall, F.R.S., "On Sound." (Juvenile Lectures.)

Patents.

From Commissioners of Patents Journal, December 22nd.

Grants of Provisional Protection.

Arithmetic, apparatus for teaching—3147—W. Grosvenor.
Artificial arms—3114—W. E. Newton.
Artificial teeth, securing—3098—G. Ash.
Barometers—3167—H. A. Bonneville.
Biscuits, machine-made, impressing designs on—2508—G. Gillett.
Brewers' grains, treating as food for animals—2898—E. J. Davis.
Candles, manufacture of from peat—2580—T. V. Lee.
Candles, sockets for—3187—W. Clark.
Carriages with endless tracks—3100—A. Nichole.
Carding engines, apparatus for feeding—3161—G. Walles and B. Cooper.
Cartridges, central-fire breech-loading—3181—W. T. Eley.
Cases, &c., waterproof linings of—3201—J. Jonas.
Clothes-press—3124—W. B. Masters.
Corn-grinding apparatus—3126—E. A. Cowper.
Cotton gins—2984—W. J. Burgess.
Cowhouses, construction of—2102—J. Gamgee.
Drinking beverage, a new—3203—J. Kaspary.
Dyeing, printing, &c.—3110—R. A Brooman.
Elastic belts—3017—C. Reader.
Envelopes—3207—H. Y. Thompson.
Fabrics, apparatus for stiffening—3209—R. Howarth.
Fibrous substances, cleaning—3120—S. W. Wilkinson.
Fire-arms, breech-loading—2772—W. E. Newton.
Fire-arms, breech-loading—3082—W. Pringle.
Fire-arms, breech-loading—3151—S. Norris.
Fish-hooks—3177—C. Baylis.
Furnaces—3136—T. L. Nicklin.
Gold chains, manufacture of—3076—J., E. R., and T. Hollands.
Grain, apparatus for malting—3087—W. R. Taylor.
Gun-barrels, machinery for rolling—3156—T. Claridge.
Guns, breech-loading—3197—W. J. Murphy.
Harmoniums, pianofortes, &c.—3149—W. E. Evans.
Iron ships, sheathing—3012—W. R. Mulley.
Lamps—3070—J. T. Hall.
Laces, manufacture of—3108—W. Clarke.
Leather-shaving machine—3118—W. S. Cluderay.
Liquids, apparatus for ejecting and ejecting—3179—A. Barclay.
Locomotive engines—3185—R. F. Fairlie.
Looms for weaving pile fabrics—3103—J. S. Templeton.
Madder, treatment of for dyeing and printing—3069—A. C. Duncan.
Maps, &c., cap for protecting the ends of when rolled—3175—St. G. H. Davies-Gwyn.
Metals, apparatus for coating—3183—E. Morewood.
Microscopes—3211—R. Beck.
Mortars, bowls, &c., apparatus for making—3159—W. Boulton and J. Worthington.
Motive power by gravitation—3046—R. M. Roberts.
Ocean steamers, construction and propulsion of—3090—I. M. Singer.
Paper, manufacture of from marine vegetable matters—2741—W. Clark.
Paper-cutting machinery—3189—T. C. Usher.
Pianofortes—3064—E. Farr and I. Gregory.
Provisions, preserving—2812—I. Baggs.
Pulp, manufacture of from *Lygeum spartum*—3219—R. A. Brooman.
Railway carriages—2858—R. Sims and R. Burns.
Railway crossings, locking and unlocking gates, &c., on—3138—G. Daws.
Railways, permanent way of—3199—W. R. Lake.
Railway signals—3032—C. F. Whitworth.
Rotary engines—3225—P. Gardner.
Rulers—3193—J. T. Griffin.
Sewing machines—3217—J. H. Smith.
Sewing machines—3079—I. M. Singer.
Sewing machines—3086—H. Hedley.
Saccharine matters, decolouring—3078—W. Clark.
Ships, apparatus for destroying at sea—2758—H. A. Dufrene.
Ships, apparatus for steering—2938—C. Atherton and A. H. Renton.
Steam-boilers—3191—J. Townshend.
Steam-cranes and hoists—3130—A. B. Brown.
Steam-engines—3213—J. Stocker.
Swivel snap—3096—E. Morin and R. Schweizer.
Tanks and cisterns—3106—F. Braby and A. Moore.
Waistband buckles—3132—J. Walker.
Water, apparatus for regulating the supply of—2710—R. Fell and D. Hammond.
Water-pipes, prevention of from bursting—3088—L. McM. Rogers.
Xylodine or gun-cotton, compounds of—3163—A. Parkes.
Yarns, sizing and dressing—3010—N. Greenhalgh and J. Mallison.

Inventions with Complete Specifications Filed.

Projectiles—3278—E. A. Dana.
Sewing machine shuttles—3205—M. Klotz.

Patents Sealed.

1700. M. Ashby.
1702. R. A. Brooman.
1709. H. M. Kennard.
1710. H. Shaw.
1711. R. A. Brooman.
1714. J. H. Johnson.
1716. H. G. Fairburn.
1727. W. Botham.
1728. R. H. Leese.
1730. R. A. Brooman.
1731. J. Cox.
1733. A. Prince.
1740. H. W. Rosser.
1744. W. H. Davey.
1759. J. Naveaux.
1767. J. Harrington.
1769. J. E. Wilson.
1777. J. W. Gray.
1781. T. S. Prideaux.
1784. W. Thomson and C. F. Varley.
1816. H. A. Dufrene.
1823. F. Taylor.
1842. J. E. Wilson.
1975. J. Ramsbottom.
2503. C. F. Cotterill.
2627. V. A. and V. J. Messinger.
2759. E. Hunt.

From Commissioners of Patents Journal, December 26th.

Patents on which the Stamp Duty of £50 has been Paid.

3432. G. H. Birkbeck.
3453. C. F. Varley.
3470. J. Johnston.
3415. G. E. M. Gérard.
3482. W. B. Adams.
3438. W. Henderson.
3442. R. Lakin and J. Wain.
3473. H. A. Bonneville.
47. M. Hodgart.
3435. A. P. Tronchon.
3452. W. Clark.

Patents on which the Stamp Duty of £100 has been Paid.

2975. W. Taylor and W. D. Grimshaw.
3007. J. H. Johnson.

Journal of the Society of Arts.

FRIDAY, JANUARY 5, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

JANUARY 17.—"On Automatic Telegraphy." By ALEXANDER BAIN, Esq.

JANUARY 24.—"On the Uses of National Museums to Local Institutions." By Lord HENRY G. LENNOX, M.P.

CANTOR LECTURES.

The concluding Lectures of the Course by G. W. HASTINGS, Esq., LL.D., will be delivered as follows:—

LECTURE III.—MONDAY, JANUARY 15TH.—"On Copyright and Trade Marks."

LECTURE IV.—MONDAY, JANUARY 22ND.—"On Limited Liability."

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing ONE Friend to each Lecture.

The tickets already issued will be available on these evenings.

PEAT AS FUEL.

The sum of £50 placed in the hands of the Council by J. Bailey Denton, Esq., to which is added the Society's Gold Medal, is offered for the production of a fuel from Peat, which shall be equal in quality to good household coal for ordinary purposes, and capable of being sold in the market commercially at less cost than such coal. The attainment of this object must be demonstrated practically and on a commercial scale.

PRIZES TO ART-WORKMEN.

The works of which a list was given in the last *Journal* are now placed in the Society's library, for the inspection of members and their friends. The following is an addition to the works sent in to compete for the Prizes offered by the Worshipful Company of Plasterers:—

61A. Truss or Bracket, in terra cotta, by "Nil Desperandum."

SUBSCRIPTIONS.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

THE CATTLE PLAGUE IN THE LAST CENTURY.

The following is a reprint of the article* on this subject referred to in the chairman's address at the opening of this session:—

After the best methods of breeding and feeding cattle, the next great object of improvement in pastoral agriculture is, the preserving them from mortal diseases; but especially from those which, in consequence of general causes, seize and carry off great numbers together. The more lax and tender habit of sheep subjects them constantly, in our country, to such a distemper, called the rot, which seems the result of principles arising from the nature of the soil and climate, and subsists always in one part or other, though with various degrees of extensiveness, according to various circumstances of place and season. But the neat cattle, being of a stronger and more hardy constitution, are not ordinarily disposed, with us, to any disorders that attack and destroy great numbers at the same time, and from the effects of the same principle. There is, however, a disease incidental to beasts of this kind, which, propagating itself by infection, raging, at times, in most countries in Europe, and carrying such destruction wherever it comes, that it may truly be deemed a pestilence of the cattle, has, in its turn, visited our island, and made us experimentally sensible of its dreadful consequences. It prevails with great malignity at this time on the shores of the continent opposite to us, whence some sparks of the contagion have been lately brought and kindled here, in more than one place, as is imagined. Happily, a quick extinction followed this introduction of it into our country, but there is the justest ground of apprehension from these instances, as well as from other circumstances peculiar to the present,† it may be again conveyed to

* The paper is entitled "Observations on the Murrain or Pestilential Disease of Neat Cattle: the Means of Preventing the Infection, and the Medicinal Treatment of the Beasts when seized with it," and is by Mr. Robert Dossie. It is extracted from his "Memoirs of Agriculture," Vol. ii., 1771.—ED. *J.S.A.*

† The prevalence of the contagion of the murrain, at this time, throughout the countries of the United Provinces, whence there seem little hopes it will be soon expelled, renders it extremely liable to be brought over to us, in consequence of the intercourse we have with those countries. It is, indeed, only under particular circumstances, as will be shown below, that the cattle, with us, is susceptible of this infection. Because, even when most diffused over our country, it extinguishes entirely of itself in favourable periods, when the general state of animals is healthful, as we have twice experienced in the present century. But the irregularities of the late seasons, and particularly the great alternations of heat and cold, the continuance of wet weather, and the frequency of easterly winds, all of which are injurious to animal strength, and, conspiring in this year, have manifestly weakened both vegetables and animals; have, consequently, rendered the cattle peculiarly susceptible of this infection, as well as mankind of those contagious distempers to which they are subject. This is not only evident from clear deductions, from demonstrable principles of physiology, but from the fact itself. There being two, if not three, instances of the contagion of the murrain having taken effect in our island, within the space of a year, in parts the most distant from each other. One was in the south, last autumn, which occasioned the issuing the orders of council that were then published, and the notice taken by his majesty in his speech at the opening the last session of Parliament. Another was far north, in Scotland, where it seems, also, to be established, on good authority, that some beasts were actually seized with this disease. The third, but not equally well vouched and ascertained to be this disorder, was in Northumberland, near Newcastle. The effects of the contagion in all these places were confined to a few beasts, and, happily, were suppressed in a very short time. But it is to be apprehended, that, from the increased disposition of the cattle to receive it, in consequence of the unfavourable circumstance of season, if the infection were again introduced, we have the most mischievous consequences to dread from it; and whoever will

us, and spread through the whole country, if the greatest care be not exercised to prevent the bringing it over, and to suppress it immediately in any particular place where it may be found to have been brought.

This disease, so fatal to horned beasts, was formerly called, in English, the murrain, but is now more generally named the contagious disease of cattle. The name of murrain ought, however, to be resumed, because, it is well known there are other infectious distempers of cattle besides this, which might possibly subsist here at the same time; and the want of a due distinction of name would, therefore, occasion confusion in the communications and deliberations requisite to the measures for suppressing them.*

The destructive effects of the murrain are but too well known from the havoc made during its continuance here, with greater or less violence, for fifteen or sixteen years. But the true nature of the disease is very little understood, and even the appearances and obvious symptoms are known in any distinct manner only to very few. Considered, therefore, either in the view of promoting the interests of agriculture, or providing the means of security against a very momentous national evil, it is a matter of the very highest importance to investigate the causes of this distemper; the manner in which its contagion acts, and may be conveyed; the symptomatic appearances it exhibits; and the mode and success of the trials already made to prevent the infection, or to cure the disease; and thence to deduce the best methods of hindering the introduction of the contagion into places free from it, or the dispersion of it more extensively when introduced, and of saving, by medicinal aid, as many of the cattle, when really infected, as is practicable, with due advantage to the owner.

It is the more necessary that all material information respecting this contagious disease of cattle should be collected, and some proper plan of proceeding for its prevention and cure, thence formed and published; because nothing of this kind, so perfect as to be of any practical use, has been hitherto given to the public in any language.

Many voluntary writers, in different periods and countries, have, indeed, published treatises on this subject, and some professors of physic and academic bodies have been called upon, by the authority of government in several states, to deliver their opinions on it; but little success, as to practical utility, has resulted from the labours of either. As to medicinal means, either for the prevention of infection, or cure of the distemper, nothing offered in these works has been carried into general practice anywhere; nothing offered in them, for reasons we shall have occasion to touch on below, having been found of actual benefit, at least in the way there proposed; and as to other preventive means of excluding the contagion from places free from it, or the hindering its spreading when it has found admission, some measures very proper in their nature, have been adopted, both with us and elsewhere, but not so effectually as to the manner, as to be accounted a full security against the danger to which, as was above intimated, some unfavourable circumstances expose us, at present, in an extraordinary degree.

With relation to the description of this disease, there are more than one work, which have considerable merit with learned readers. Dr. Layard's treatise, published in our own country, and Professor Camper's, published in Holland, both contain true accounts of the symptoms and appearances; but they are delivered in such technical terms and manner, as render them not clearly intelligible to any but persons acquainted with medical subjects; and consequently, not practically useful to owners of cattle in general; nor to others who may have concern with the cure or prevention of the murrain. As to the theoretic observations on the nature and process of this disease, there is nothing hitherto exhibited to the public, but references of it to the school hypotheses of the sect of each writer; or reasonings from single particulars, in which the conclusions are no way sufficiently warranted by the premises; nor correspondent, in most points, with the general phenomena.

Induced, by the importance of the subject, together with the apparent want of a more familiar description of the appearances of this distemper of horned cattle, and just account of its nature, as well as of the means of prevention and cure, as they may be thence deduced, I have here attempted to supply this deficiency* as far as the brevity, prescribed me by the want of greater room in this volume, would admit. The other parts may be enlarged on to advantage, and are intended to be more amply discussed in a treatise published on this subject solely; but the description of the appearances of the disease, which is at present by far the most essential of all other communications respecting it, not requiring more compass than can be afforded to it, is fully given here.

I shall, therefore, first offer some general account of the murrain, with respect to the manner and periods of its former appearance here, and in other places; the general effects of it; the susceptibility of the cattle, as to its infection; the conveyance of the contagion; and the means hitherto proposed for the prevention of the infection, and the cure of the distemper. I shall next describe the true symptoms and minute appearances of it; and, as far as can be inferred from them and other facts respecting it, explain the true nature of the disease, and point out the indications of cure. To this I shall afterwards subjoin some observations on the best method of medicinal treatment for saving such of the cattle as are curable, and the proper means of rendering effectual the plan of regulations ordained by the Government for the prevention of the contagion.

Accounts of contagious diseases of neat cattle are found in the writings of the ancients, and in those of most of the periods betwixt them and us,† in which the

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examine well the present orders and regulations of the government made to hinder the spreading of the contagion, will find that we can have very little dependence on them for our security against this momentous evil, as they now stand.

* The having a particular name for the pestilential disease of cattle here treated is the more necessary, because another contagious malady of cattle is said to have broken out lately in Italy, and is called the *cancer volant*. We have, as yet, no perspicuous account of the symptoms of that malady. But from the name, if it have any allusion at all to the similitude betwixt that disease and cancers, we must conclude it to be very different from the murrain; and as this new disease may spread itself over the other countries of Europe, and possibly reach us, it is particularly proper, at present, to keep the names distinct.

* While the disease was rife in this country, I endeavoured to amass all the information in my reach respecting its nature, appearances, and cure, as well from immediate observation as books. Since that time I have extended the knowledge I then collected by the communications of several able professors in the countries where this disease has more lately prevailed; and particularly by a correspondence with an ingenious physician in Holland, who has, in a particular manner, applied himself to the consideration of this subject, for which there is, at present, but too great opportunity in his neighbourhood. I presume myself thence able, not only to give a more succinct and and clear account of this disease, but also to furnish some new lights, which may lead to the obtaining a more effectual method of medicinal treatment of the diseased beasts, and likewise to the supplying those defects, and removing those difficulties, which render the provisions made by the government against the introduction of the contagion into our country of less avail at present.

† Among the authors who have mentioned, or treated of the contagious diseases of cattle in the earlier times, the principal are Aristotle, M. Portius Cato, Plutarch, Virgil, Livy, and Columella. Among those of the later period are Vegesius, Eginardus, Gesner, Aldrovandus, Fracastorius, Ubbo Emmius, and Outhoff. Since the year 1711, that this disease has run through all the countries of Europe, there are great numbers of Dutch, German, Danish, French and English writers on it,

state of letters has afforded an opportunity to transmit to us the passages of the times. Several of these accounts do not specify the symptoms attending on the diseases; but some describe them, though with a diversity of circumstances in some from others, and with a variation in all from the appearances now found in the murrain. Such variations of the same disease, at different times, and in different places, happen, however, in other instances; and it is, therefore, not easy to determine whether the contagious distempers of the cattle mentioned in the earlier writers, were all, or any of them, really the murrain or not. If, nevertheless, it be a matter of difficulty to ascertain this point, it is happily of as little consequence; because, as we shall see below, the means related to be used for the prevention or cure of those diseases, except the methods of hindering the conveyance of the infection, which are equally proper in all such cases, appear trivial and inefficacious; and, therefore, no practical advantage can be drawn from settling these doubts respecting the identity of the disease, as might have been, had these means proved to be more effectual.

The first clear traces we have of the later introduction of the murrain into Europe commence in the year 1710 or 1711; at which time there are authentic accounts that it was observed in Hungary. Whether it was brought thither from other countries, most probably further to the south-east, or if not, how it was originally generated there, we have no lights that lead to any certain knowledge. But it was conveyed thence into Dalmatia, and propagated through that country to the neighbourhood of Padua, whence it spread over the whole of the Venetian state. It was soon afterwards disseminated through the whole of Italy, and passed, in 1713, through the Tyrolese into Germany; whence it communicated itself to almost every other part of Europe, as far north as Denmark and Sweden, introducing itself also about that time into Great Britain. After this, in consequence of more favourable seasons, the contagion abated by degrees in all the places where it had prevailed, and in about nine years the infection seemed to be exterminated in most of them. There is reason to believe, notwithstanding, that some lurking remains kept their ground in parts where the relaxation of moist air, and the debilitating effects of putrid vapours rendered the cattle more susceptible of all contagion. For, in the beginning of the late king's reign, the disease revived here to such a degree as to give occasion to the government to make some regulations for the suppression of it, though after a short time the infection again seemed to have been extinguished. It also appears to have shown itself in some parts of Germany even to the year 1730.

In the year 1740 or 1741 this disease again broke out in the south-eastern parts of Europe, and made its progress through the same countries as in its former course after 1710.

It was brought hither in 1744 or 1745, from Holland, as is believed, and made great devastation of the cattle for several years, after which it declined considerably, but took fresh vigour in 1756, and continued to rage with considerable violence for some time. It then abated gradually, and, as far as appears, the infection, at length, was wholly lost; as for a number of years we had not the least signs of it before the autumn of the last year, and since, when it is believed to have broken out afresh in two or three places of the island, though not, as there is reason to believe, from any relics of the former, but the introduction of a new contagion brought from other countries. In the meantime, though we have been free from the murrain for a number of years, yet it has during that period visited other places. Denmark and Jutland, in particular, felt it in 1769, with greater severity than has ever been known elsewhere. The United Provinces have undergone a yet harder fate, from some disadvantageous circumstances in the temperature of their climate. For since its first introduction, in 1741, it has never entirely left them, but maintained its ground, though with various degrees of violence, at different times, and at present it makes great ravage in the parts of those countries where cattle most abound.

either in detached essays, or pieces inserted in journals and periodical works. The chief of these are Lancisi, Ramazini, Perrault, Pujerus, Blasius, Bates, Blondel, Goeliche, Ranold, Bruckneros, Engelman, Noseman, Tak, Kroot, Manchart, Brocklesby, Mortimer, Buffon, Grashuys, Marquis de Courtivron, Sweake, Layard, Camper, and Monchy.

These later invasions of several parts of Europe by the murrain, have furnished the opportunity of making the following general observations on its effects and consequences.

It is to be remarked that as the infection of this disease prevails only at particular times anywhere, and acts with greater violence at some times and in some places than others, according to the preceding view of its migration, so it affects only part of the cattle anywhere, and those with various degrees of malignancy. This leads us to explore in what this difference of the cattle's being susceptible of the infection, or exempt from its effects, when exposed to it, may lie. On examination of this matter it will appear that where the infection does not before subsist, it never comes but after some general cause has weakened the habit of the beasts in general, such as very severe cold, long continued want of a sufficient quantity of wholesome food, repeated alternations of heat and cold in the weather, moist air, replete with putrid vapours, a long continuance of easterly winds, or, what is more frequent, a combination of two or more of these causes together. Thus we find this contagion invading every part of Europe after the year 1711, when the season had been so inclement the year before as to destroy a great portion of the sheep in England; and again in 1741, as mentioned above, after a very intense frost, which lasted from December to April, and by the rigour of cold and scarcity of fodder, had reduced the cattle in general to a debilitated state, which was still aggravated by the almost constant easterly winds that blew the summer and autumn following. After the abatement of it, in more clement seasons, which followed that period, we find the disease resuming its force again in various places, since that time, by similar accidents. We see, also, that from the same principles, it has long maintained its ground in countries where moist air and vapour of stagnated water disposes to agues and other diseases that come from the laxity of the fibres, which disposition is equally produced by these causes, in the brute and human species. While, on the other hand, it has been extinguished in places where a drier and purer air gives robustness and vigour of constitution to the animals, it had been observed, also, that the infection, when it has abated during the summer or winter, has generally resumed fresh vigour in the spring and autumn, when the alternations of heat and cold have disordered and weakened the beasts.

The same principle, with respect to the cause of the prevalence of the contagion, holds good, as to the particular beasts which are seized with the disease, or escape the contagion when exposed to it. For we see, in all cases, it is the weaker which are attacked by it, and the stronger which remain free from it. It is ascertained, by a very sufficient basis of remark on facts, that the beasts of a black, dark, or red colour, either wholly or in mixture, are less subject to the infection than those which are white, or of a light mixture of colours; and the concurrent observation of all times has established the belief that this difference of colour is an indication of the greater or less degree of natural strength of the beasts, as well in neat cattle as horses. It is equally certain that bulls are less subject to the infection of this disease than oxen, oxen than cows, cows not pregnant than those which are; and, among all these, such beasts as appear naturally of a feebler make, or are debilitated by any accidental suffering.

It is manifest, too, from an equal ground of observation, that the same difference in strength and weakness which renders the cattle more or less susceptible of the infection, makes them more or less liable to the violence of the effects of it. Those which are weaker from any of the above causes have more aggravated symptoms, and more frequently die of the disease in proportion to the degree of such causes.

It results, therefore, from these circumstances, that though infection conveyed from some beasts diseased with it is the efficient cause of the murrain in cattle, yet there is a predisponent cause, or particular state of the subject, absolutely necessary to its acting or taking effect; and this predisponent cause is the condition of the beast with respect to weakness of habit or relaxation. It appears also that this weak state of the beast may arise from general causes, either of an epidemic nature, affecting whole regions, such as inclemency of season, or scarcity of wholesome food; of an endemic nature, affecting only particular places or countries, such as dampness of the air, or abundance of putrid vapours; and it may be produced also from some particular cause regarding the individual only, such as original weakness of constitution, pregnancy, or debility occasioned by some accidental suffering.

The susceptibility to the infection, and the predisposition to be more violently affected by it, in consequence of the weakness of the habit, are neither peculiar to cattle nor to this disease. It is evident, from what offers, in a very extensive field of observation, that both mankind and brutes are liable to the attacks of most contagious disorders in proportion to their defect of strength. Even were it not so well verified by notorious facts, a theoretic proof might be drawn from incontestible principles of physiology, and from the constant effects of medicine administered in such cases. But this is too wide a range of subjects to be entered on here, and would, besides, require a previous acquaintance with medicinal science in order to its being understood. That beasts are liable to take the infection of the murrain, and suffer more from it, in proportion to their weakness, is sufficiently obvious from just remarks on the subject itself; and it is very necessary to be understood and taken into consideration in all practical disquisitions on that disease, because it constitutes a principle which admits two very useful applications. It not only affords the means of prognosticating, when great numbers or single particulars, will be seized with the disease, if exposed to the contagion, and, consequently, supplies the proper notice and warning for the use of preventive methods, but it furnishes, likewise, the true indication of cure, and points out what the regimen should be that will counteract the disease.

The manner in which the contagion may be conveyed is likewise a matter of great moment in the consideration of the murrain with a view to the preventing its injurious effects.

The observations already made on facts have not set everything relating to it in a clear and decisive light. There are some opinions respecting it, in which all agree, because they are supported by evident instances; but there are others which, though they have the sanction of common assent, may yet be disputed on very just grounds. It is unquestionably certain, that the murrain is communicated by transmission of some contagious matter from beasts which have that disease to those which are sound; but that this is done by all the means of communication generally supposed is not at present so manifest a matter.

The effect of inoculation in the murrain, as well as a great number of other palpable facts, render it plain that the contagious matter may be carried by other bodies, which receive it from the diseased beast, and convey it, by actual contact, to the sound. This may be performed by any substance to which the infecting particles can adhere, but is most likely to happen, through accident, by the mediation of any body that is of a hairy, woolly, or pilous texture,* because the matter is much less liable to be rubbed or cleansed off from such bodies, than from those which are denser and have an entire and smooth surface.

But there is another mode of conveyance of the infecfection, which, though it must be allowed to subsist with regard to some contagious disorders, admits of a doubt with respect to the murrain, that is, the communication of the contagion by the air. It is in general taken for granted that the air is the chief vehicle of the contagion of this disease, and several means of prevention of its action have been instituted on that principle. But there is no clear fact which in the least proves this notion, and the universal failure of the preventive means founded on it, furnishes arguments against it, as far as anything at all can be thence inferred. On the other hand, a great number of circumstances seem to evince that the cattle are never infected, but by an actual conveyance of the contagious matter, by means of contact of a sound beast with one that is diseased, or with some other body, which receives first the virulent matter from such beast. There are many instances where good fences, and other effectual means of exclusion of whatever could bring the infecting matter, have prevented the cattle in particular places from suffering by the contagion, though surrounded on every side by numbers of beasts seized with the disease. In some of these places the cattle have escaped to the last. In others, after a time they have taken the infection in consequence of known accidents, which occasioned the introduction of the contagion, from the actual conveyance of it by somewhat that had received the virulent matter from a diseased beast. Where the neighbouring infected cattle were, in these instances, all on one side the place in which those that escaped were confined, this exemption of them might be reasonably imputed, as it has been, to the wind blowing the contrary way, and carrying off the contagious effluvia that might have otherwise reached them. But this solution of the difficulty cannot hold good, when, as has been frequently the case, the free place where the cattle escaped was surrounded by infected beasts on every side. The determination of this point is not merely a speculative object, for it settles the proper nature and limitations of the means to be used for the prevention of the communication of the infection, and rightly confines them to such as regard the hindering the contact of diseased beasts with the sound, or the exclusion of bodies which may convey the virulent matter from the one to the other.†

* It has, however, been strangely made a matter of doubt by some eminent professors in the United Provinces, whether the skin itself of a dead infected beast would impart the contagion, and they have even asserted the negative, in consequence of the result of certain experiments made for the determination of this point. But some fallacious circumstance attended those experiments, as appears even on the face of the relation. It would, indeed, require very strong proofs to gain assent to such an opinion, than which a stranger paradox can scarcely be advanced. It is evident the infection is conveyed by other substances; and nothing can be more suited to collect and retain the matter of it than a hairy skin. The matter must, undoubtedly, abound in the skin of the beast which generates it, whether it be evacuated by the perspiration, saliva, or any other excretion. Indeed, whatever other bodies convey it must in general receive it from the skin, which, if it can impart the same to them while the animal is living, must, in common with other bodies, retain it a certain time after the beast is dead.

† The opinion that the infection of the murrain is conveyed by the air, has been adopted by the writers on this subject, successively, in all the different periods since this disease was first known, without any examination of the fact on just ground of proof. It seems to have been received on the authority of Hippocrates, who said all diseases were communicated by the air. But this is a bad foundation for such a notion. For his meaning in this general assertion appears plainly, by other passages, not to be that all diseases are communicated by contagion transmitted by the air, but that the air has always some share in the original productions, or in the reception o

From the facts which have appeared respecting the disease, there is season to infer that the contagious matter retains its infecting power a considerable time. The contagion is believed in several instances, from very strong circumstances, to have been conveyed to remote places in bodies transported by sea, as the known intercourse with the countries whence it was presumed to be brought palpably suggested that manner of its introduction, which could not be otherwise accounted for. Some of the later experiments with regard to the inoculating cattle with the disease show this fact with greater certainty of proof. The precise limitation of period in which the infecting matter will keep its power is not, however, well ascertained by any observations or trials; but there is room to conclude that, under some circumstances, it will act at a considerable distance of time from its being generated. We see the variolous matter will communicate the small-pox after many months; and there is no foundation for any doubt of the analogy betwixt the contagion of that and of the murrain in this particular. But it is a matter of great consequence, and this should be decided by adequate experiments. Because the knowledge of it is of great moment, in judging of the proper means and regulations for preventing the introduction of the contagion into places free from it.

The space of time, likewise, betwixt the beasts receiving the infection and the perceptible effects of it, is not yet precisely settled by accurate observations. But there are well-known facts that give us a considerable degree of information with regard to it. In general, appearances will be found in three or four days; in some few instances they may not come on till six or seven. We may state the latter time as the utmost period, unless when the beasts are very slightly affected with the disease, and then, where the symptoms may not be discernible till it be in its most powerful state, ten days may be allowed. If a beast, therefore, suspected to have received the infection, do not show any signs of it in six or seven days, there will be very little danger of its being seized; and if none appear in ten, it may be taken for granted that there is no infection in the case.

The time for detaining cattle in any place to which they have been removed, after having been exposed to a risk of the infection, in order to prevent their spreading the disease to other parts, may be therefore limited to a fortnight. Since there is not the least hazard after such time of their being seized with the disease, in consequence of their having been exposed to the contagion so long before.

These are the general facts and observations respecting the murrain which have hitherto presented themselves. It is proper to subjoin that, as before intimated, this disease has various appearances, symptoms, and degrees of mortality, at different times, and in different places; as the epidemical effects of the seasons, or endemical circumstances of particular countries, have interfered with the natural process of the disease. In the United Provinces a profuse diarrhœa, or looseness, is a very common symptom, and generally carries off the beasts by exhausting their strength; but, where they do not recover, it seems to be the critical evacuation by which the virus of the disease is discharged. Eruptions more rarely attend the murrain in that country, though they are not always wanting. On the contrary, in Great Britain the looseness seldomer happens, and is mostly a mortal symptom, though, in some few cases, a salutary one. Eruptions occur much more frequently, and are generally the critical deposit of the virus when the beasts recover. In Denmark the disease, when it made its furious attack in 1759, was far more violent and mortal than it was ever know in England or Holland, or than it had been when it infested the same places before. The fatal crisis was then very rapid, the beasts dying in two or three days, and some sooner, after they first appeared to be affected. At some periods, remarkable blisters on the tongue are related to have been an early and general symptom of this disease;* they are not near so frequent now, and only found at or towards the end of the disease. Like variations are, as above intimated, seen in other malignant contagious diseases; and render an accurate observation of the symptoms, when they break out fresh at a distance of time, necessary to the forming a just description of them, in order to the distinguishing them with certainty from others which are similar.

(*To be continued.*)

them by particular subjects. And even this doctrine is not to be maintained on any demonstrative principles. For we are certain that there are contagions of which the infection is not conveyed by the air, as the venereal disease, elephantiasis, yaws, and itch, and we know so little of the origin of them, that we can by no means presume to say the air had any part in their first production. In the elephantiasis, and in most other contagious diseases, it does, indeed, appear, that the air, epidemically or endemically, may act as a predisponent cause to the contagion's being received; but there is a great defect of evidence of its being actually a vehicle of the contagion with relation to most such diseases. Because it is very difficult to prove, in any particular instance, the infection may not have been communicated, by means of some other body, from the diseased to the sound subject. It must, nevertheless, be allowed that some contagious diseases are transmitted by the air; but, on nice examination of facts, we shall have reason to conclude them much fewer than are generally allowed; and that, perhaps, we have no competent proofs of any case where the open air has been the vehicle, though there are many clear cases where air, long confined in close places, or depraved by the respiration of too great a number in the same room, has conveyed the infection of such diseases.

* There is, as was above observed, another contagious disease of the cattle, of which blisters on the tongue seem, from the accounts of it, to be a constant, principal, and characteristic symptom; and proper care, therefore, should be taken to avoid confounding this disease with the murrain, either in reading or practice. It appears to have been curable, in most subjects, solely by opening the blisters; and is, therefore evidently of a much less malignant nature than the murrain; in which, as is well known, from many trials, that operation would be of very little avail. This circumstance alone would give a sufficient criterion for distinguishing the one from the other.

IMPROVEMENTS IN RAILWAY CARRIAGES.

Mr. Rock Chidley has recently brought out an invention for improvements in railway carriages, which consists mainly of affording easy means of communication through the whole of the carriages of a train, and an economical mode of warming and ventilating them. For the first object the inventor proposes an opening at the end of each carriage, the connection being made by means of a covered or hooded platform, constructed so as to expand if required from a space of a few inches to one of several feet. The object is to give the guard of the train an easy means of communicating with any of the passengers. Below the flooring (which is perforated) of each carriage a serpentine pipe is placed, and the pipes below adjoining carriages being connected they can be supplied with steam from the engine for the purpose of warming. Simple provisions for a safety valve and self-acting taps for the discharge of the condensed water have been made. The degree of heat is regulated by means of a perforated slide worked by a simple contrivance inside the carriage. Ventilation is accelerated by admitting the air through the perforated flooring required for the warming, and by an air passage between the top of the compartments and the roof of the carriage, on which latter are set ventilators, having a cowl above to turn with the wind. Another way is by means of self-acting valves. The inventor considers either plan sufficient to secure the carrying off of vitiated air and at the same time preventing down draught. A new arrangement of doorway intended to render ingress and egress of passengers safer than at present is a part of the invention.

RETURNS OF LIVE STOCK IN GREAT BRITAIN.

The following correspondence and schedule explain the steps taken by Government to procure the required returns:—

Office of Committee of Privy Council for Trade, Whitehall, 6th December, 1865.

SIR,—I am directed by the Lords of the Committee of Privy Council for Trade to request that you will move Secretary Sir George Grey to cause the County Magistrates in England and Wales (and the corresponding authorities in Scotland) to be informed of the steps about to be taken by the Board of Trade, for the purpose of ascertaining the number of Live Stock existing in Great Britain.

My Lords rely much upon the good offices of the County Magistrates, whose assistance will be most valuable in advising their own tenantry and the neighbouring farmers to give prompt and careful attention to the schedule to be transmitted to them by post, for a return of the number of Live Stock upon land in their occupation.

The published correspondence upon this subject between the Cattle Plague Commission and the Board of Trade will explain the object of the inquiry, and my Lords entertain the hope that the required information will be successfully obtained by voluntary returns from the farmers and occupiers of land. But it is very desirable that no means should be neglected of guarding against the refusal of information in consequence of misapprehension on the part of the farmers as to the intentions of the Government in making the present inquiry.

The collection of returns from so large a class of persons as the occupiers of land in Great Britain can only be undertaken by the Government; and it is of course desirable, on the ground of public economy, that officers already employed in the public service should, if practicable, be made available for collecting the statistics of Live Stock.

In order, therefore, to avoid creating a new and costly machinery, the distribution and collection of the schedules will be intrusted to the department of the Inland Revenue, acting on behalf of the Board of Trade.

The schedules will bear the post-office stamp for transmission to and return by each occupier of not less than five acres of land.

There will, therefore, be no occasion to trouble the occupiers by a personal application for the return, if they will only be good enough to fill up the schedule and return it by post, according to the address printed upon it.

As the value of the information will depend upon the completeness of the returns, it will be necessary to make a further written or personal application to occupiers who neglect to fill up and return the schedule.

It is to be hoped that this trouble to the occupiers and the officers employed will seldom be necessary, as it will occasion delay in the publication of the results of the inquiry; and an early knowledge of the supply of stock in the country is manifestly most desirable.

Every endeavour will be made to obtain the returns with the least possible trouble and inconvenience to the occupiers of land, and it is the earnest hope of my lords that English agriculturists will show themseles as ready to afford information of such special and national interest as the agriculturists in Scotland, Ireland, and foreign countries.

Copies of the correspondence between the Cattle Plague Commission and the Board of Trade, and of the form of schedule to be transmitted to the Board of Trade are enclosed, which my lords suggest should be transmitted with the letters from the Secretary of State.

I have the honour to be, Sir,
Your obedient Servant,
J. EMERSON TENNENT.

The Under Secretary of State, Home Office.

CORRESPONDENCE REFERRED TO ABOVE.

Cattle Plague Commission, House of Commons (Principal Floor, Room 10), Westminster, S.W., 24th October, 1865.

SIR,—I am desired by Her Majesty's Commissioners for inquiring into the origin, nature, and treatment of the cattle plague, to represent to you, as president of the Board of Trade, the importance of obtaining correct information respecting the number of horned cattle and sheep existing in the country.

Such returns, if they were in existence, would be valuable on the present occasion.

I may mention that the government of the Netherlands, which is in possession of returns of this kind, is thereby enabled to publish weekly an exact statement not only of the positive but of the proportionate loss in every commune which has been attacked by the disease. Such a statement could not be published here. This, however, is by no means the only way in which such information would be useful.

I have the honour to be, &c.,
(Signed) MOUNTAGUE BERNARD.

The Right Honourable T. Milner Gibson, M.P., &c., Board of Trade.

Office of Committee of Privy Council for Trade, Whitehall, 3rd November, 1865.

SIR,—I am directed by the Lords of the Committee of Privy Council for Trade to acknowledge the receipt of your letter of the 24th ultimo, addressed to the President of the Board of Trade by desire of Her Majesty's Commissioners for inquiring into the origin, nature, and treatment of the Cattle Plague, to represent the importance of obtaining correct information respecting the number of horned cattle and sheep existing in the country.

The representation of the Commissioners has received the prompt and anxious consideration of My Lords, and they entirely concur with Her Majesty's Commissioners as to the importance of ascertaining the stock of cattle existing in this country.

If such information were obtained it could not fail to be of great utility and interest, at the present time, to the agriculturists as well as to the public at large.

It appears that this country is almost exceptional in not possessing returns of the number of its cattle. Unfortunately it is for the chief division of the United Kingdom, England and Wales, that there is an entire absence of information, upon which reliance can be placed, as to the stock of cattle. Returns of the live stock in Ireland are annually obtained; and the number in Scotland was ascertained in the years 1855-6-7. The farmers in Ireland and Scotland have readily furnished this information by voluntary returns, and it is only in a similar way that the same particulars could at present be collected for England and Wales.

The Lords of the Committee of Privy Council for Trade are most desirous to promote the inquiry proposed by Her Majesty's Commissioners, and will take immediate steps to invite the co-operation of English agriculturists in a work of such manifest interest and importance.

I am, therefore, to request you will inform Her Majesty's Commissioners that orders will forthwith be given for the preparation and distribution of schedules for ascertaining the number of each kind of live stock in Great Britain. The inquiry will be extended to Scotland, in order to obtain the information for the three divisions of the United Kingdom at one time.

The number of live stock belonging to individual persons will not be divulged.

Aggregate returns of stock will be prepared for specified districts, and such results only will be printed and published by the Board of Trade.

I am, &c.,
(Signed) J. EMERSON TENNENT.

Mountague Bernard, Esq., &c.

BOARD OF TRADE.—SCHEDULE FOR RETURN OF LIVE STOCK.

It is particularly requested that this schedule may be filled up on the day of 1866, and transmitted, immediately, by post, to the collecting officer (name and address given). The returns of individual occupiers will not be published.

Number of Live Stock upon Land in the occupation of the undersigned, on the day of , 1866.

If separate farms in two or more parishes be occupied, separate returns of stock are to be made for each.

Parish of——— County of———

1. Stock taken in to graze is to be returned as belonging to the occupier of the land upon which the stock is grazing.

2. Stock driven to fairs, markets, or elsewhere for sale, upon the day of , should be included in this return by owners of such stock.

	Number of Cattle (Not including Horses).			Number of sheep.		Number of Pigs.
	Milk Cows.	Other Cattle. Two years of age, and above.	Other Cattle. Under two years of age.	One year old and above.	Under one year old.	
Please insert on this line, in Figures, the particulars required.						

Signed Occupier.

The Cattle Plague Commissioners have reported that it is highly desirable to obtain returns of the number of cattle and sheep within the area of every parish in Great Britain.

GARDENING IN PARIS.

There are few things in Paris which strike the visitor more than the luxuriant exhibition of flowers which meets the eye in all quarters. In the gardens of the Tuileries, the Louvre, and the Luxembourg, in the ornamental beds and around the fountains in the Champs Elysées, in the Bois de Boulogne, at one extremity of the city, and in the Bois de Vincennes at the other, in the beautiful little Parc Monceaux, in another pretty pleasure ground, less known to strangers, in the Batignolles, in the garden formed around the fine old gothic Tower of Saint Jacques, near the Hotel de Ville, and in a dozen other squares and ornamental corners of the city, every scrap of available space is filled during the greater portion of the year with a profusion of ornamental trees and shrubs and thousands of flowers, indigenous and exotic. Nor is it in the streets and gardens alone that this floral abundance is to be seen; whenever a ball or other entertainment is given, at the Hotel de Ville or elsewhere, under the municipal authorities, the halls, staircases, and *salons*, are decorated with brilliant flowers of almost every description. It may easily be guessed that all this decoration is the result of an extensive and careful organisation, and that the gardener of Paris has no sinecure. The establishment, or rather establishments, in which these shrubs and flowers are reared for the city of Paris—the supply of the palaces and other places belonging to the State is derived from other sources—are in fact not only extensive, but perhaps unique of their kind and admirably organised.

M. Barrilet Deschamps, who fills the post of gardener-in-chief to the Ville de Paris, has his head-quarters at Passy, just without the limits of the Bois de Boulogne, and adjoining the property known as La Muette, once a royal hunting-box and summer-house, and now the residence of Madame Erard, widow and mother of the famous pianoforte manufacturers of that name. This establishment includes a considerable space of garden ground, in which are reared half-hardy shrubs and flowers, and upwards of twenty glass houses, some of them of great size, for the rearing of exotics and for their preservation during the cold months of the year. The striking-house is a model of excellent arrangement, the heat of the various parts being carefully graduated to meet all circumstances, and every inch of space being economised with the greatest care. The cuttings and young plants are placed under several different kinds of glass, according to their size and form; the former are placed in thumb pots, embedded in tan, and are covered with large circular glasses; tall bell-glasses, or shades, are used for certain plants, while larger ones are placed under quadrangular glass cases of various dimensions, with sloping tops, hinged at the upper portion of the zinc frame. Several modes of heating are employed and careful experiments made as to the results, and amongst other systems now under trial is one of heating by means of gas in the open air, the pipes passing under ground, and the plants being merely protected by an awning, so as to give them the double advantage of warm soil and fresh air. Of the conservatories, two of the largest are those which contain the collections of *Camelia japonica*, some of which are planted in the ground, and from which the flowers are cut for decorative purposes, while others are in pots and boxes and are transported wherever they may be wanted. A large portion of this collection is historical, having been originally in the gardens of Malmaison, the residence of the Empress Josephine.

There are nearly a hundred persons employed in this establishment; besides the director, M. Barillet Deschamps, there are, a chief gardener, an inspector, whose duty is to watch over the parks, squares, and other places which are supplied with flowers, and to see that they are all kept in proper condition; fourteen gardeners, each having the management of a section of the establishment; from twelve to twenty sub-gardeners, forty-four pupils, and eighteen boys. The number of parks, gardens, squares, and public places to be supplied with shrubs and flowers, as far as possible all the year round, is said to amount to more than seventy, and towards this work the municipal garden contributes annually two millions and a-half of plants. Its cultivation is confined to new plants, half hardy and exotic; there are, under the same direction, another garden at Vincennes for hardy plants, and two nursery grounds in the Bois de Boulogne for shrubs and trees.

A few weeks since when the writer visited the establishment at La Muette, nearly the whole of the conservatories were empty, the two millions and a-half of flowering plants were on duty all over Paris; during the last fortnight the weather has changed the order of things, the more tender children have already gone home to their winter quarters in the nursery, their somewhat more hardy brethren are following fast, and in another week or two all who are unable to face the wet and cold of the winter months will be housed, and scarcely a square foot of space in the whole range of glass houses will be unoccupied. Every year naturally increases the demand for space, and every season the establishment becomes more extensive and more interesting.

The gardening in the Bois, public pleasure grounds and plantations, is also under the charge of M. Barillet-Deschamps, and there are about five hundred gardeners and labourers employed in these various places. The flowers and shrubs are conveyed to and from La Muette by means of large, shallow spring vans, which belong to the establishment, but the horses, not being required all the year round, are hired.

Another feature of the Paris garden deserves notice; no plants are sold, and scarcely a leaf, certainly not a cutting, can be taken out of the establishment; the regulations are most strict in this respect, but a system of exchange is established which is very beneficial to the

gardeners of Paris and other places, as well as to the municipal establishment. A catalogue of the plants in cultivation is published annually, with prices attached, and exchanges are made with those who possess any new species or varieties of plants, or any, in short, that the director may require; the packages are charged according to a printed tariff, and the cost of transport is paid by those who make the exchanges.

Amongst the plants to which the gardener of the city of Paris has paid special attention are the large-leaved plants of Algeria, the Philippine Islands, and other warm regions, some of which are of gigantic growth, and specimens of which are to be seen at every season in all the gardens of the city. The Banana has been extensively cultivated, and there were, not long since, many fine specimens growing in the open air; one especially in the Parc Monceaux at least twelve feet in height, and bearing an immense bunch of fruit, which may be developed in the warm atmosphere of its winter quarters at La Muette; the leaves of this plant are at least six feet long, exclusive of the foot stalk; this is the finest specimen that has yet been sent out of the nursery; it is of the variety known as the Banana of Paradise. The bamboo, and the castor oil plant, have been introduced with great success in all the gardens. Several varieties of palms also are to be seen growing in the open air during the summer months. The Hibiscus is another tribe with which M. Barillet-Deschamps has been very successful; of these the *Rosa sinensis* is the most remarkable, it grows to the height of several feet, from five to eight or ten, and bears a profusion of magnificent red blossoms, almost as brilliant as those of the cactus, though not of the same hue; to give an idea of the rates at which exchanges are made, it may be mentioned that small plants of this shrub are marked in the catalogue at one franc each, plants thirty inches high at five francs, and those of five feet in height at ten francs: the *Hibiscus giganteus* and *Speciosus roseus* are also fine shrubs, bearing, the former, yellow and brown, and the latter bright rose-coloured blossoms. Of the special collections, the following are the most important:—That of the *Araliacæ*, of which the garden possesses forty species; of those the *Aralia papyrifera* is most remarkable, its leaves attaining a diameter of fifteen to eighteen inches. The *Aroidæ*, consisting of more than fifty species, including *Alocasia cuprea*, and *metallica*, with their metallic copper-coloured leaves; *Colocasia*, *Philodendron* and *Xanthosoma*, each in numerous varieties. The collection of Ficus includes nearly all the kinds known, and more than fifty species are offered for exchange. Bigonias have been propagated to a great extent, amongst others *Miniata fuschioides*, with its small leaves and beautiful coral bells, which flourishes luxuriantly in the open air in Paris; *Begonia boliviana*, with leaves more than two feet in diameter; *Begonia prestoniensus*, with its flowers of cinnabar red; *Begonia tomentosa*, with blood-red leaves, and many other beautiful and curious species. *Canna*, first planted out in the open air in Paris, in 1855, are to be seen in the public gardens every summer in great variety. The collection of *Dracæna* includes thirty or forty species. A large number of ornamental graminiferous plants for the decoration of lawns, amonst which are the *Andropogon formosum* and other varieties; *Arundo mauritanica; Bambusa*, some of which attain the height of twelve and even more feet in the open air; *Cinna arundinacea; Eryanthus ravennæ*, from the shores of the Mediterranean; Saccharum and others. The semi-acclimitisation of the *Musa rosacea*, *discolor*, *sapida*, *sinensis*, *vittata*, has been very successful, and many other species are raised in the gardens. The collection of *Solanum* is said to be the most complete that has ever been seen on the continent; seventy or eighty varieties are largely cultivated, and many more are now being brought forward; the greater portion of this class of plants has succeeded well in the open air of Paris; amongst these may be named the varieties, *Amazonicum*, *atrosangineum*, *auriculatum*, *betaceum*, which attains the height of ten feet; *bonariense*, *calycarpum*, *crinitum*, with superb foliage; *discolor*, with spotted stalks; violet leaves and rose-coloured flowers; *Encodontum*, with great spiny stems; *Pastigiatum giganteum*, with masses of purple flowers; *glutinosum*, *Japonicum*, *laciniatum*, and *marginatum*, the finest of all the kinds introduced into cultivation in Paris, with large silvery leaves and splendid white flowers, with a small purple star in the centre. No class of plants, however, has received more attention than the Pelargoniums, of which nine hundred varieties are cultivated in the garden, and which flourish in the parks and squares in great beauty and profusion. Amongst other novelties lately introduced is a species of Amaryllis, with blue flowers, presented to the garden by an amateur.

The transplantation of large trees has been carried on with great success in Paris during the last ten years; long boulevards and whole plantations have been planted with trees of all sizes, removed from the woods belonging to the state, and generally with great success. A tree thus transplanted to the Park Monceaux has attracted considerable attention; it is a fine *Araucaria imbricata*, raised from seed in the Jardin des Plantes twenty-seven years since, and taken to Vannes, where it flourished till 1863, when it was brought back to Paris. This tree is twenty feet high; its roots, which are spongy and very delicate, measure more than ten feet in length, and it had to be carried nearly three hundred miles, a difficult operation successfully performed. Another remarkable case, mentioned in the *Journal of the Imperial Society of Horticulture*, is that of a chesnut tree, more than sixty feet high, and of which the root, with its surrounding mould, measured forty metres cube. This large tree was also moved with complete success. The method adopted is that invented, or made use of, by the late Sir Joseph Paxton; after the roots have been dug round, and the tree isolated, a strong waggon, or rather frame upon wheels, and open behind, is backed so as to enclose the tree, which is then raised by chains and windlasses attached to the waggon, and afterwards conveyed in an erect position.

PARIS EXHIBITION OF APPLIED ART.

This exhibition has recently closed, and has proved the greatest success of the kind that has yet been achieved in France. According to the official account, 215,000 persons visited the exhibition, not including nearly a thousand artists, journalists, and their friends. The receipts amounted to a sum equal to £5,622, and the expenses to £1,422 less, leaving the last named sum to be applied, according to the rules of the society, to the purposes of its museum and library.

The prizes awarded for industrial designs were seven in number, one of one hundred francs, one of two hundred, and five of five hundred francs each; and for industrial products, six prizes of honour in gold, and forty of the first and sixty-three of the second-class in the form of large bronze medallions, bearing the head of Apollo surrounded by rays, and beneath a group of emblems of art and industry. This medallion is the work of a sculptor named Liénard, whose design was chosen from amongst a large number in competition. The heads under which the exhibition, and consequently the prizes, were classed were as follow:—Art, as applied to house decoration—to stuffs for furniture and articles of dress—to furniture—to the common metals, the precious metals, and other costly materials—to glass and porcelain—to education and general extension—and to miscellaneous matters.

At the distribution of the prizes, addresses were delivered by the president of the *Union Centrale des Beaux Arts* and several other gentlemen, the chief interest attaching to the explanations relating to the proposed College of Industrial Art, of which an account has already been given in the *Journal*. M. Duruy, the Minister of Public Instruction, was present, and addressed the assembly, and M. Guichard, the president,

took the opportunity of publicly giving to that gentleman the honour of the conception of this grand idea, and in so doing related the following interesting circumstances:—"It is just a year ago, almost to the day, that the Minister visited the Museum of the *Union Centrale*......He immediately saw, with the rapid perception of a mind constantly intent on every kind of study and all forms of progress, the whole scope of our intentions, comprehended and approved our modes of action, and encouraged us to proceed in what he believed to be a very promising scheme. Presently, placing his hand on a portrait of Saint Peter, a *chef-d'œuvre* of embroidery, the work of I know not what artist of the sixteenth century......the Minister told us that he had worked with the view of obtaining admission as an *ouvrier* at the Gobelins, and added, with a smile, that he might therefore take upon himself to say something about art and its application to industry, and, after some remarks on the want of general knowledge amongst modern as compared to ancient artists and artworkmen, dwelt on the necessity for developing, enriching, and illuminating the thoughts, the intellect, and the soul of the artist at the same time that his hand is being educated, for it was only by this double education that great masters and glorious schools of art were founded. It was after this visit that the minister proposed to the Council of the *Union Centrale* the idea of a college of applied art which he had cherished for a long time in his mind. The Council took three months to consider the question, and at the end of that time came to the determination of using all its means and energy for the establishment of such an institution." M. Guichard then explained, to quote his own words, that no professional study would take place in the college in question, and, in pursuance and explanation, he quoted the following passage from a recent work by the minister, M. Duruy:—"In our time a deplorable system of education tends to divide the man instead of completing him, and to develop one of his faculties instead of establishing an equilibrium amongst them all; that is what is called professional education, the education of specialities. This education, more industrial than human, will finish by materializing humanity; it forms admirable instruments and deforms the man. If this almost brutalizing education, founded solely on the materialist principle of the division of labour, is not reformed, special men will become more common, and truly great men more rare than ever." The college education would therefore have for its aim, said M. Guichard, the opening to its pupils of all the sources of the true, the good, and the beautiful, not only on their plastic, but in their immaterial manifestations.

It may be added here that the *Union Centrale* has completed the purchase of the land for the erection of the college in question, which consists of a site measuring 12,000 square mètres, and situated in the Faubourg Saint Antoine, not far from the spot where the old Barrière du Trône, better known as that of Vincennes, stood previous to the recent extension of the limits of the city.

Fine Arts.

ART-BUDGET IN FRANCE.—The Minister of Finance includes in his estimates for the year 1867 the sum of 7,951,000 francs, or nearly £320,000, for decorative works connected with the Palace of the Tuileries and the new Opera-house.

PICTURES BY LIVING FRENCH ARTISTS.—The late Duc de Morny, it is well-known, possessed an excellent gallery of works of art, for the reception of which he constructed a gallery in his official residence annexed to the Legislative Palace; the Comte de Walewski, who succeeds to the presidency of the Corps Legislatif, has proposed to the Government that a portion of the works of living artists which are the property of the State shall be placed in this gallery. It is said that the count's proposition has been agreed to, and, if so, Paris will have the commencement of another exhibition, and the Palace of the Deputies, as well as that of the Senate at the Luxembourg, will have its gallery. The residence of the President on the Quay, opposite to the Tuileries, would be a most convenient spot for a public gallery.

Manufactures.

EXCEEDINGLY HARD IRON.—The *Mechanics' Magazine* says:—Some years ago M. Gaudin found that by heating iron, tolerably free from carbon, with a small quantity of boron, to a very high temperature, he obtained a product which could not be forged, but which possessed extraordinary hardness. He has now found that an equally hard metal may be obtained by adding to ordinary cast iron, in fusion, phosphate of iron and peroxide of manganese—he does not mention in what proportions. The product cannot be forged, but it casts easily, and is therefore readily applicable to the construction of such machines, or parts of machines, as require in their material extreme hardness rather than tenacity. The metal so produced is moreover singularly sonorous, and M. Gaudin accordingly proposes it as a material for bells. He finds that a still harder metal is producible by the addition of tungsten—again he omits to say in what amount—to ordinary cast iron. He states that this tungsten iron surpasses everything previously known as a material for tools for cutting rocks, and that crystals of it will cut glass as readily as the diamond.

NEW ARTIFICIAL MARBLE AND CEMENT.—M. Sainte Claire-Deville has lately made an interesting discovery and a series of experiments, which may lead to important practical results. The investigation originated in an observation of the effect produced by water on a sample of magnesia obtained by the calcination of chloride of magnesium. This anhydrous magnesia, in compact fragments, says M. Deville, was left for several months in a current of water running from a tap in his laboratory at the Ecole Normale, and finally assumed a remarkable consistency, having the density and more than the hardness of marble. When divided into rather thin pieces, it became translucent, like alabaster, and the interior of the mass was crystalline. At the end of six years, during which time it was exposed to the air, no change took place in its condition. When analysed, it was found to contain—Water, 27·7 parts; carbonic acid, 8·3; alumina and iron, 1·3; magnesia, 57·1; and sand, 5·6. M. Deville pulverised some of this substance and mixed it with water, till he produced a semi-plastic mass, and he then left it for several weeks in a tube containing distilled water deprived of gas by boiling, and enclosed in a glass tube hermetically sealed. The magnesia combined slowly with the water, and became as compact and as hard as the first-mentioned specimens. The desiccation caused by exposure to the air caused it to become crystalline and translucent. Some medals were cast with this new substance, treated like plaster, and they assumed under water the appearance of mastic. A mixture of chalk or marble with pulverised magnesia, made into a slightly plastic paste with water, is said to mould well, and to assume extreme solidity under water. M. Deville proposes to apply this substance to busts, and hopes to produce a very valuable kind of artificial marble. But another and far more general and important application of the discovery is that of the making of cement. M. Deville calcined a quantity of dolomite, rich in magnesia, at 300 to 400° centigrade, less than dark red heat, mixed the powder with water, and tried the product as a cement. Experiments have been made with this cement in salt water, and they are reported to have been eminently satisfactory. M. Deville's reputation as a chemist gives great importance to this communication

in a theoretical point of view. The only question, therefore, that remains to be solved is the cost of the new artificial marble and cement, as compared with those at present in use.

Commerce.

Beet-root Sugar.—According to official returns, the weight of the green beet-root taken into the manufactories of the Zollverein during the season 1864-5, amounted to 41,641,204 cwt. The numbers of beet sugar manufactories at work throughout the German States during the three seasons 1862-3, 1863-4, 1864-5 respectively, were 247, 253, and 270. The past season, says Herr Licht, in his last circular, has shown itself much more favourable, not only in respect to the amount of beet manufactured, but also with regard to the yield of sugar obtained, than could have been foreseen. According to the latest communications received, the quantity of raw beet-root necessary for the production of one hundred-weight of sugar is not 12·5 cwt., but scarcely 12·2 cwt., and, in consequence, the quantity of raw sugar produced in the season 1864-5, was 170,662 tons, against 151,180 tons and 138,042 tons in the two preceding seasons, 1863-4 and 1862-3 respectively. In France also, according to the latest official returns, there was an increase of 2,896 tons in the sugar production of the past season. The total amount of beet-root sugar produced in Europe during the season 1864-5 has been 482,634 tons, against 385,743 tons in 1863-4, and 452,135 tons in 1862-3 respectively. The beet-root crop of the Zollverein, which is peculiarly difficult to estimate, will show, in the province of Saxony and in the principality of Anhalt, a deficiency of about 10 per cent. as compared with the previous year; which deficiency was more than made up by the extraordinarily rich harvest in Silesia, Hanover, Wurtemberg, and other provinces. For France, the previous estimates of 200,000 tons are now generally raised to 220,000 tons: some have even gone as high as 240,000 tons. The sugar crop of the Zollverein in the season 1864-5 was 170,672 tons, against 151,180 in 1863-4; and 138,042 in 1862-3; in the present season (1865-6) in consequence of the unfavourable weather, the crop is not expected to amount to more than 170,000 tons, although a wider extent of land is now planted with beet, and although the number of factories is greater. In Austria it is assumed that the yield will be from 300,000 to 400,000 centners below that of the previous year. Poland has had a very good beet-harvest, and the yield of sugar is expected to be 2,500 tons more than that of the preceding year. Russia, on the other hand, will produce 10,000 tons less, in consequence of the beet not having come to maturity. The estimate for the beet-root sugar productions of Europe during the season 1865-6 is about 530,000 tons, about 50,000 more than last season, and 150,000 tons and 75,000 tons larger than the produce of seasons 1863-4 and 1862-3 respectively. It must, however, be borne in mind that, in consequence of the abnormal state of the weather during the past year, these estimates, which are formed in advance, will probably undergo considerable modification.

The Duties on Foreign Wines in England.—The *Memorial Diplomatique* says:—"Our Vienna letters inform us that the chief difficulty which had retarded the conclusion of the commercial preliminaries between Austria and England consisted in the hesitation of the St. James's Cabinet to lower its tariff in favour of Austrian wines. Mr. Gladstone, foreseeing that France, in virtue of her treaty with England, would immediately claim for her own wines all the advantages that might be accorded to the Austrian, proposed to place those of the latter country in the second class of the English tariff, which includes potable liquors whose alcoholic strength reaches 25 degrees. On examination, the concession was found to be illusory, inasmuch as Austrian wines, with the exception of some few of Hungarian growth, had an alcoholic force inferior to the above. As, however, the Austrian Government persisted in making the diminution of the wine tariff a *sine qua non* condition of the new commercial arrangements, the English ministers ended by adopting the step of equalising the duty on wines, by fixing it for all countries and qualities, and without any difference on account of alcoholic strength, at one shilling per gallon, whether the wine be imported in casks or in bottles. The English Cabinet having entered into a formal engagement to present a Bill with that object in the next session of Parliament, the preliminaries have been at last definitely signed at Vienna. Thus, owing to the efforts made by Austria, England is at length about to accomplish a customs' reform which was ardently demanded by the French wine-producers, and which consists in assimilating the duty on wine imported in bottles to that levied on the same in casks. This difference of duty was an almost insurmountable obstacle to the propagation and consumption of French wines amongst our neighbours on the other side of the Channel. Henceforward the wine-trade in France will derive from the Anglo-French treaty of commerce all the advantages which the Emperor's Government was justified in expecting."

Indian Tea.—Whilst in China (say Messrs. Travers) the question of our tea supply is always more or less connected with and influenced by political disturbances; in India, so far as tea is concerned, we have nothing to recount but the continued extension of the tea-plant, and the great success uniformly attending its cultivation. This extended cultivation is, of course, greatly stimulated by the prevailing high prices for all kinds of tea, the tendency of which is to encourage production, not in China only, but also in India and Japan. Insignificant as the amount of Indian tea may perhaps appear, as compared with the returns from China, it is certain that this uniformly increasing cultivation must soon make itself felt in our tea markets. As soon as the cultivation of the tea-plant in India is of a sufficiently extensive character to admit of the Indian teas being imported in any considerable quantity, the rivalry between the two kinds—Chinese and Indian—will be commenced on more equal terms; at present the scarcity and the high price of Indian tea preclude its being brought within the reach of consumers in general. As our supplies increase so also does consumption, but not in the same ratio; nor, looking at the probable extension of the tea-plant in China, and its known extension in India, is it likely that these two essential elements of commerce—supply and consumption — will exactly, or even approximately, coincide? So far as consumption is concerned, it seems by no means improbable that an additional field will soon be opened in the French market, by the reduction of their tea duties.

Colonies.

New South Wales Revenue.—The comparativ statement of the Consolidated Revenue of this colon and of the special funds paid into the Treasury durin the quarters ended 30th September, 1864, and 30th Sep tember, 1865, respectively, shows that the total revenu proper for the quarter ended the 30th of September las amounted to £430,843 9s. 8d., against £378,178 12s. 1 for the corresponding quarter of 1864. The increase o the quarter is therefore £52,664, or a little over 14 p cent. The most important item in this increase, an which now appears for the first time in the reven returns, is that of Stamps, which has yielded £15,28 The Package duty, which only came into force on t 25th of May last, has brought in £13,415 16s. 6d. I respective of that charge, the Customs revenue is great

by about £11,000 than the corresponding quarter of last year, the increase being chiefly made up by the additional 20 per cent. placed on all the duties excepting brandy, gin, tea, and sugar. Increased revenues have also been obtained from land sales and from the balances of conditional purchases. The heads of revenue which show an increase are:—The Customs, £24,394 18s.; duty on refined sugar and molasses, £1,305; gold, £1,5[illegible] 4s. 3d.; land revenue, £18,483 15s. 2d.; commission on money-orders, £215 4s.; fees of office, £[illegible]79 4s. 7d.; rents, exclusive of land, £359 2s. 4d.; railway receipts, £1,030 6s.; electric telegraph receipts, £1,243 13s.; pilotage and harbour dues, £214 7s. 3d.; stamps, £15,284 3s. 4d. The heads of revenue which show a decrease are:—Duty on spirits distilled in the colony, £3,430 5s. 2d.; Mint receipts, £574 1s. 11d.; postage, £792 12s. 1d.; licenses, £1,852 13s. 10d.; fines and forfeitures, £180 6s. 11d.; miscellaneous receipts, £5,[illegible] 5s. 2d. In the Customs revenue there is an increase on all the articles excepting coffee and chicory and wine. The decrease on the latter, however, is only £51 8s. 9d. Under the head of Land Revenue, there is an increase of £19,674 8s. 8d. on land sales, and a sum of £11,364 8s. 3d., as the balances of conditional purchasers, with a sum of £3,424 as the interest on those balances. The rent and assessment on pastoral runs has, however, fallen off to the amount of £15,246 7s. 1d. During the first nine months of the present year the total revenue proper has amounted to £1,136,442, against £1,005,994. The increase in favour of the present year is therefore £130,448, or nearly 12 per cent.

Publications Issued.

ELEMENTS OF PHYSICS; OR, NATURAL PHILOSOPHY WRITTEN FOR GENERAL USE IN NON-TECHNICAL LANGUAGE. By Neil Arnott, M.D., F.R.S. (*Longmans.*)—Part II. is now issued, completing the work. Part I. was issued some time since, and a notice of it appeared in the *Journal* of April 15th, 1864. The present is the 6th edition, and the only one which has ever been completed. It has much additional matter on subjects previously treated, and also contains chapters, now for the first time published, on electricity and astronomy, with an outline of popular mathematics.

Notes.

THE ARCHITECTURAL PRESS AND CAPTAIN FOWKE.—A correspondent writes:—One or two persons having raised doubts as to the confirmation by the press of the judges' award to Captain Fowke's plans for the Natural History Collection, the following extracts are made from the only newspapers which are known to have criticised the plans in detail. The award was made by Mr. Tite, M.P., Mr. Fergusson, Mr. Pennethorne, architects; Mr. D. Roberts, R.A., an architectural painter; and Lord Elcho; and no voice was raised in Parliament impugning their decision. The *Telegraph* said, "If the judgment arrived at unanimously we believe by such an art-conclave as this be at all questioned, it must be questioned on its own merits, and apart from the competence of those who have pronounced it; of that competence there cannot be the shadow of a doubt." Before the award the *Builder* said, "Decidedly the most conspicuous, or in some respects the most meritorious, set of drawings in the exhibition, is that which faces the entrance, and is marked with the motto 'Ad ogni uccello suo nido è bello.' It includes nine frames of drawings, drawn and mounted with skill and taste. The perspective is sketched in brown ink, and tinted, with a masterly hand. The judges will decide whether it tallies with the instructions. No other competitor has addressed himself more completely to the question of the appropriation of the whole ground, extending from the situations indicated by the instructions as to be appropriated to the Natural History Museum and the Patent Museum (that is the east, skirted by Exhibition-road, to the western extremity, bounded by Prince Albert's-road). His view is taken from the south, making the Cromwell-road the boundary, that way, of a most effective group of buildings, as in the drawing, composed of a centre mass and for subordinate masses, the latter being one at each angle of the ground, and the central mass being crowned by a large dome and four smaller domes." The *Building News* said, 'Ad ogni uccello suo nido è bello.' Though by no means the chastest, this is perhaps the most effectively conceived renaissance design exhibited. It is symmetrical in plan and general arrangement, and is illustrated by a very taking perspective view, which no doubt will help to place it in the foremost ranks of the 'premiated.'" After the awards were made, the *Daily Telegraph* said, "That the choice should have fallen on Captain Fowke is nevertheless a fact in itself certain to surprise everybody. It has, if we are rightly informed, surprised the judges themselves beyond measure. Lord Elcho and Mr. Tite will assuredly not be accused of any occult favouritism; their previously formed opinion of the design for the International Exhibition is pretty generally known, and it is probable that views not more indulgent were taken by Mr. Fergusson and Mr. Pennethorne, if not by Mr. Roberts; yet here is Captain Fowke, of all men, chosen to furnish the design for national buildings at South Kensington, of all places!"

PARIS EXHIBITION OF 1867.—The *Belgian Moniteur* says that, in consequence of the accession of the Duke de Brabant to the Crown, Count de Flandre has accepted the Presidentship of the Belgian Commission for the Paris Exhibition.

CROSSING THE CHANNEL.—The London correspondent of *Saunders's News Letter* states that a company is being formed to place on the Channel a line of steamers from Dover to Calais, so large that the railway trains shall run on board them, and there bodily remain to be run out again on the other side, when the passage is effected, and which, by the same magnitude, it is expected will ride over the waves without putting the passengers to the slightest inconvenience. The miseries hitherto inevitable to this passage have been chiefly entailed by the restriction to boats of a size proportioned to the shallowness of the water on either shore; but the new pier at Dover overcomes that objection on this side, and the French Goverment have (it is said) granted a concession for the requisite extension of that at Calais on the other.

TIMBER FOR SHIP BUILDING.—The French Government has given publicity to the following:—"There exists in the territory of Washington, in the United States of America, a channel formed by the waters of the Straits of Fuca, which penetrates a hundred and fifty miles into the country. This stream, known as Paget's Sound, is sprinkled with numerous islands, which contain forests of pine trees of the species so much in demand for ship-building. Amongst these islands is one called Lamano, on which the pines attain gigantic proportions. Some French vessels have already taken freights of timber from this neighbourhood. The ships sent to Paget's Sound for spars should be of not less than seven hundred tons capacity. The cargo may be completed with planks, small spars, and squared wood fit for railway sleepers. It is very important that, in order to save loss of time and money, the shipper should send notice from San Francisco to the timber merchants in the Sound, informing them when the vessels may be expected. The obtaining and shipping a cargo occupies about two months."

NEW MAGNESIA LIGHT.—The Italian journals announce the discovery of a new artificial light, by Pro-

fessor Carlevaris, of Genoa. The Carlevaris light is oxy-hydro-magnesian, and it is produced by the combustion of a salt of magnesia (not a costly substance), in a mixture of oxygen, either with pure hydrogen or with common gas. The light is described as white, rich in actinic rays, steady, and giving little heat. For photographic purposes it is said to be excellent. The light is said not to be affected by currents of air, and to be extremely cheap; a light equal to four composition candles is set down at two centimes, or less than a farthing per hour. An experiment was tried at the lighthouse of Genoa. The new light is reported to have proved superior to that of the ordinary lamps in use there, which represent twenty-three Carcel lamps, and to have cost not more than three-pence an hour.

Photographic Plans.—It is announced in Paris that the optician Chevalier has succeeded in arranging an apparatus for taking geometric plans by photography. The instrument is provided with a meridional telescope, and a compass in order to set it to any given point; a circular collodionised glass is placed horizontally at the bottom of a camera obscura, formed of copper, and moved by clock-work, so as to describe within a given time the entire circle of which the station chosen is the centre, and the various objects as they are received in turn by the lens are photographed on the circular plate through an extremely narrow slit in the side of the copper box. The operation is to be repeated at three stations in order to avoid error, and the result is said to be highly satisfactory. The three circular plates are then used to lay down on paper all the points of the plan described. The same instrument working vertically, instead of horizontally, serves also for levelling.

MEETINGS FOR THE ENSUING WEEK.

Mon. ... R. Geographical, 8½. M. P. B. Du Chaillu, "Second Journey into Western Equatorial Africa."
Medical, 8½. Lettsomian Lecture, by Dr. Anstie.
Odontological, 8. Annual Meeting.
Tues.... Medical and Chirurgical, 8½.
Civil Engineers, 8. Inaugural Address of Mr. John Fowler, President.
Zoological, 8½.
Syro-Egyptian, 7½. Mr. J. Bonomi, "The Pharaohs of the Bible."
Photographic, 8.
Ethnological, 8.
Wed.....Geological, 8.
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
R. Society of Literature, 4½.
Thurs.. Royal, 8½.
Antiquaries, 8½.
Royal Society Club, 6.
Fri...... Astronomical, 8.

Patents.

From Commissioners of Patents Journal, December 29th.

Grants of Provisional Protection.

Aerial navigation—3283—W. Clark.
Air, deodorizing impure—3287—J. J. and E. Harrison.
Animal and vegetable substances, preserving—3172—A. V. Newton.
Atmospheric railways and carriages—3173—A. Doull.
Bed quilts, table, and toilet covers—3255—T. Jones and J. Buckley.
Bichloride of carbon and chloride of sulphur—3253—R. Ransford.
Billiards, adapting ordinary tables for playing—3186—H. S. Marshall.
Blasting powder—3206—A. Budenberg.
Bread, cutting—3251—H. C. Litchfield.
Buttons—3164—G. T. Bousfield.
Carriages, drag for—3227—A. E. Dobbs.
Carriage wheels, naves and axletree boxes of—3210—L. L. Sovereign.
Chimney cowl—3052—H. E. Newton.
Cigars or pipes, tray for—3102—R. A. Brooman.
Cloths, endless—2966—J. H. Whitehead.
Coal, retort for extracting products from—3285—J. Gibbon.
Coke ovens, utilizing the waste heat of—3048—W. E. Gedge.
Door mats, &c., made principally of india rubber—3216—G. Barber.
Driving belts, leather—3148—C. D. Hitchcock and J. Shimmon.
Electro-telegraphic purposes, wire conductors for—3180—W. Boggett.
Eucalyptus and myrtacean plants, preparation and application thereof as tobacco and snuff—3174—R. A. Brooman.
Felt hats—3281—W. E. Newton.
Fibrous substances, combing—3182—J. Warburton.
Fibrous substances, opening and cleaning—3233—T. R. Hetherington and S. Thornton.
Fire-arms, breech-loading—3178—T. Wilson.
Fire-arms, breech-loading—3249—J. Aston.
Fire escapes and builders' scaffolds, apparatus for—3128—E. Vagg.
Floating structures, mooring—3265—C. Liddell and R. S. Newall.
Foot protectors—3273—A. H. Thurgar.
Garments, buttons and studs for fastening—3160—F. Dahls.
Goods, &c., 'lifts' for raising—2900—J. Norris.
Grain, screening—3239—H. W. Miller.
Gun barrels, &c., metal tubes for—3289—T. Rickett.
Hay, apparatus for elevating—3198—E. L. Walker.
Horses, &c., apparatus for apportioning the fodder of—3237—J. Mason.
Hot-water dishes, &c.—3146—J. Parkes.
Indian rubber—2630—A. A. Lerenard.
Leather skins, splitting—3277—G. T. Bousfield.
Locomotive engines—3259—J. A. Longridge.
Materials, apparatus for mixing—3243—W. Robinson.
Motive power, turbines for obtaining—3222—W. Brookes.
Paper pulp—3245—W. A. West.
Photographic surfaces, preparing—3199—V. M. Griswold.
Pistons—3279—J. H. Johnson.
Pulleys—3231—W. Winter.
Pyrotechnic toy—3195—T. King.
Railroads, permanent way of—3168—H. A. Bonneville.
Railway bars, &c.—3084—T. W. Dodds.
Railway bars—3224—J. Sanderson.
Railway steam engines and carriages—2928—J. A. Loubat.
Railway trains, signalling on—3291—M. Siegrist.
Railway wheels, tyres for—3158—R. E. Price.
Rivets, finishing—3200—H. K. York.
Rock, boring—3218—F. B. Doering.
Screwing and tapping machine—3166—E. Watteeu.
Seamen's hats—3241—J. Lancaster.
Sewage, utilization of—2626—J. Linton.
Sheep ointment—3208—C. K. Tomlinson and C. J. Hayward.
Ships, protecting the bottoms and sides of—3000—C. P. Coles.
Shutters, folding—3194—J. Goddard.
Slate, &c., cutting or getting—3297—W. F. Cooke and G. Hunter.
Spinning, preparing grasses for—3156—O. Maggs and G. H. Smith.
Steam, boiler for generating—3235—J. C. Wilson.
Steam, cooking by—3162—G. T. Bousfield.
Steam, generating—3269—R. A. Brooman.
Steam power, cultivating land by—3226—P. W. Bowen.
Sulphur—2993—A. C. St. P. de Sincay.
Swings—3229—C. P. Button.
Truss—3202—C. Easby.
Tubes, tool for cutting—3214—A. V. Newton.
Water closet—2912—P. Ellis.
Weaving, looms for—3152—J. Woollatt.
Weaving, utilizing waste healds for—3257—F. Johnston and W. Astley.
Winding machinery—3116—J. J. Ashworth.
Wood, tools for cutting—3188—W. W. Hulse.

Inventions with Complete Specifications Filed.

Railways, permanent way and wheels of—3322—H. A. Dufrene.
Steel and purified iron—3300—H. A. Bonneville.

Patents Sealed.

1739. F. Delamare-Deboutteville.	1775. J. and A. Longbottom.
1742. R. A. Brooman.	1793. J. M. Macrum.
1743. J. Keighley.	1802. J. Hopkinson and J. Whitelock.
1746. L. Faure.	1979. A. V. Newton.
1747. G. Davies.	1980. A. V. Newton.
1754. C. de Bergue.	2065. A. Budenberg.
1758. G. and D. Hurn.	2405. W. Watkin.
1764. W. Clapperton and A. Lyle.	2534. C. J. Tinker.
1774. W. S. Parfitt.	

From Commissioners of Patents Journal, January 2nd.

Patents Sealed.

1757. S. Bates.	1809. I. Baggs.
1761. L. H. G. Ehrhardt.	1810. W. E. Newton.
1766. J. and R. S. Dale.	1812. J. F. Heather.
1770. R. A. Brooman.	1817. C. O. Papengouth.
1771. W. E. Gedge.	1822. D. Cowan.
1779. H. Emanuel.	1855. A. E. Molin.
1783. J. H. Smith.	1902. J. Walton.
1791. J. W. Swan.	1924. J. Rigg.
1794. P. M. C. Beziel.	1957. W. E. Newton.
1795. A. F. Morelle.	2040. A. Millochau.
1796. E. H. Waldenstrom.	2098. W. Bunger.
1799. H. D. P. Cunningham.	2185. G. W. Howard.
1800. T. F. Henley.	2196. F. A. E. G. de Massas.
1801. F. A. Wilson.	2265. S. Chatwood.
1803. J. Bullough.	2344. J. P. Woodbury.
1804. J. George.	2380. G. A. Keene.
1806. W. Goulding.	2671. T. McGrah.
1807. G. Fentiman.	

Patents on which the Stamp Duty of £50 has been Paid.

24. E. Skull and E. Mealing.	3481. R. Bottomley.
30. W. E. Newton.	8. J. Jones.
41. W. E. Newton.	9. W. Shutter.
3472. J. H. Johnson.	34. J. Howard and J. Bullough.
3477. J. E. Carter.	

Journal of the Society of Arts.

FRIDAY, JANUARY 12, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

JANUARY 17.—"On Automatic Telegraphy." By ALEXANDER BAIN, Esq.

JANUARY 24.—"On the Uses of National Museums to Local Institutions." By Lord HENRY G. LENNOX, M.P.

CANTOR LECTURES.

The concluding Lectures of the Course by G. W. HASTINGS, Esq., LL.D., will be delivered as follows:—

LECTURE III.—MONDAY, JANUARY 15TH.—"On Copyright and Trade Marks."

LECTURE IV.—MONDAY, JANUARY 22ND.—"On Limited Liability."

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing ONE Friend to each Lecture.

The tickets already issued will be available on these evenings.

INTERNATIONAL HORTICULTURAL EXHIBITION AND BOTANICAL CONGRESS.*—PRIZES FOR IMPLEMENTS.

The Council of the Society of Arts offer the under-mentioned prizes (amounting to £50) for subjects exhibited in Section IX., under Classes 231 and 232.

CLASS 231.

(A.)—Half-size model, showing the best principle of construction for a tent for horticultural exhibitions, capable of being extended by a multiplication of the parts exhibited. A prize of £10.

(B.)—The best transplanting machine for weights of eight tons and upwards. A prize of £10.

(C.)—The best transplanting machine for half-ton weights and upwards to two tons. A prize of £5.

(D.)—The best method of ventilating plant structures, to be shown by a model. A prize of £5.

(E.)—The best garden wheelbarrow in principle of construction. A prize of £3.

(F.)—The best sunshade for garden seats. A prize of £3.

(G.)—The best guard for protecting young trees from animals, in parks, orchards, and pleasure-grounds. A prize of £3.

(H.)—The best instruments for working to levels and slopes in garden-ground work. A prize of £2.

CLASS 232.

(A.)—Earthenware boxes for edgings, capable of producing any length of straight and curved lines for borders in conservatories. A prize of £3.

(B.)—Ornamental flower pots of large dimensions, of common red clay, for specimen plants, and for terraces. 1st prize, £3; 2nd prize, £2; 3rd prize, £1.

The arrangement of all articles shown in classes 231 and 232 must be completed by Monday, the 21st of May, 1866. Such articles must be entered on or before May 1. Intending competitors should apply to Mr. R. Dean, 1 William-street, Albert-gate, W.

* See *Journal* for Dec. 22nd, 1865, p. 86.

PARIS UNIVERSAL EXHIBITION OF 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for without delay.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

SUBSCRIPTIONS.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The Committee met at two o'clock on Wednesday, the 20th Dec. 1865, Present:—Henry Cole, Esq., C.B., in the chair; Lord Gerald Fitzgerald; Sir John Harington, Bart., Edgar Bowring, Esq., C.B., Colonel Scott, R.E., and B. St. J. B. Joule, Esq.

Mr. G. A. MACFARREN examined by the committee:

448. Mr. Macfarren, you are well-known as the composer of several pieces of music?—I have composed several.

449. I believe you were a pupil of the Royal Academy of Music?—I was.

450. How many years since?—I entered the Academy in the year 1829.

451. Who was the principal at that time?—Dr. Crotch.

451. You have received a set of circular questions which this committee has issued to various musical authorities?—I have.

452. And you have written your replies to those questions?—Yes.

453. Would it be agreeable to you to put in those answers as your evidence on these points?—Yes; if I have the advantage of enlarging on them as they are read to the committee.

[Sir John Harington then proceeded to read the questions from the printed circular, and the replies thereto.]

3. *The expediency or otherwise of taking the present Royal Academy of Music as the basis of any enlarged Institution in this country.*

I think it expedient to take the Royal Academy of Music as the basis of any larger institution for cultivating music in England, because; firstly, the Academy has lived down the opposition of the musical profession, many members of which, at first, considered its establishment inimical to their interests; secondly, the success of many of its pupils, and the high position gained by some of

them as composers, singers, players, and teachers—the last, most particularly throughout the provinces, has gained the academy a reputation, and won for it a confidence such as would cost any new foundation many years to acquire; thirdly, the regard for the Academy of those whom it has educated, and the feeling of fraternity among them, secure a large number of supporters, or, at least, defenders, to the institution, and induce a considerable sense of fellowship in the profession, based on the idea of common studentship of one general school; and fourthly, the long working of the Academy affords experience of the requirements and the means of meeting them peculiar to this country, of measures to be avoided and to be persevered in, and of countless matters of detail that would cost years in mastering to any new institution.

4. *What improvements might be effected in the Academy of Music?*

I think the following improvements might be effected in the Royal Academy of Music:

A. That the honorary committee should confine its functions to the appointing of the Principal and other Professors and officers of the institution, and the dismissal of these if they failed in their duties; to the canvassing for subscriptions and other patronage; to the introducing qualified students of the Academy to opportunities for the exercise of their ability.

B. That in other particulars the Academy should be managed by members of the musical profession, under some such constitution as a principal, supported by a council or board of professors, composed of single representatives of the chief branches of study—namely, harmony, singing, the piano-forte, bow-instruments, and wind-instruments.

C. That all the professors of the institution should be subject to the approval of the principal and his colleagues, who should communicate with each professor after the periodical examination of the pupils, and direct his attention to any particular points of failure in those under his care.

D. That every professor should teach according to his own system; that each professor should have a sub-professor under him, to prepare pupils for admission to his class, by teaching them according to his system, subject to his occasional examination; that the promotion of pupils from the class of a sub-professor to that of a professor should be, when vacancies occurred in the latter, according to the pupils' degree of advancement; and that the professor should be consulted by the principal as to the appointment of his sub-professor, such sub-professor being a pupil of the Academy if any were competent.

E. That English instead of Italian should be the language chiefly employed for the practice of singing; that there should be no professor of singing who was incompetent to teach singing in English; and that the study of Handel's songs should be an essential element in the vocal course.

F. That the orchestra should be completed with performers on the most important instruments; either by the admission of students, upon exceptional terms, for those instruments which are not in general demand (as in this particular, good results might arise from the arrangements with band committees, proposed in my answer to No. 7), or by the engagement of professors to fill the deficiencies.

G. That the Academy should be placed in connection with a church or chapel; if not, have one included in its own establishment, in which, on Sundays, full cathedral service should be performed by a choir comprising the whole of the Academy students. The great advantages of this would be that the musical tastes of all the students might be raised by a knowledge of the class of music performed; that those of the students whose aims were so directed might be qualified for ecclesiastical appointments; and that the public might witness a celebration of the English church service on a larger and consequently grander scale than that of any which is at present held in the whole country—pre-supposing, of course, that the pupils are properly prepared, by regular training and by weekly rehearsal, to do justice to such an important responsibility.

H. That the periodical performance of operas, or scenes from operas, with action, form a portion of the regular course of singers' instruction—except, naturally, if any singer objects to take part in this branch of study.

I. That the practice of instrumental, and also vocal concerted chamber music, should be carried on under the direction of a professor.

J. That an organ of complete modern compass—in the Academy Chapel or elsewhere—should be at the service of the students for receiving lessons and for daily practice.

K. That periodical lectures be given on musical history, exceptional points of theory, æsthetics, and other matters that may not be included in the class lessons.

L. That a department be instituted for the special cultivation of military music.

M. That the Academy be rendered so far independent in respect of funds, as to have no need to receive pupils for the sake of their fees, when they showed no satisfactory indications of talent.

I think it of vital importance to preserve the fundamental regulations at the Academy, which require that every student learn harmony, the pianoforte, and sight-singing; that every male student (except singers) learn an orchestral instrument, and, when qualified, take part in the orchestral practice; that every student take part in the choral practice, and that concerts be given, public and private, for the exhibition of the talent of the pupils.

454. *By the Committee.*—You appear to lay considerable stress upon the study of English?—I think it of most serious consequence. I think the public will not listen with interest to the singing in Italian of English singers. The world at large looks to English singers for the performance of English music. It is a rare exception that an English man or woman can sing with good effect in Italian. For the most part I think they do not sing their own language with so good effect as is desirable; and giving the chief part of their study to Italian, stands in the way of their arriving at that excellence which is indispensable to efficient performance of English words. If more attention were given to English, and less to Italian, there would be greater chance of approaching excellence in the one, instead of a negative merit in the other. Of course there are brilliant exceptions to this, but I speak in general. Singing in English I conceive to be the most important thing to be considered. It is unfortunate, I think, that the singing-masters of the academy at present are mostly Italians. Not to speak of competency to teach English, they mostly teach Italian songs—the old hacknied songs, which do not increase in interest. As perhaps the finest compositions to English words are to be found in the songs of Handel, when persons sing them with good effect, to teach these to singers would go further to make a valuable vocal school in England than any other course. I have a precedent for this in the general practice in Germany. I have seen a large collection of German programmes, in which the songs are all in the German language, whatever the language in which they were originally written, and the words to be sung were that native to the singers and the audience.

455. You would not wholly ignore singing in Italian?—I speak of English as the principal and the other as the exception. In private tuition out of the academy, Italian is the principal, and English the very small exception.

456. Do you happen to know if the practice in Paris and Brussels is to sing generally French words rather than Italian?—I cannot vouch for it, but I believe from hearsay it is the practice to sing French words.

457. Is not the Italian training of the voice considered the best?—I believe it is by some persons. So far as I can give an opinion—not being myself a teacher of sing-

ing—you can bring out the beauties of the English language—which is as full of beauties as any other—when properly sung, if the practice is in English; but if the practice be in a language which requires a different vocal mechanism, it has the credit of being an ill language for the purpose; moreover, persons who practise Italian words, when they come to sing English words, will not declaim to the best advantage. The fine setting of English words in the music of Handel, when properly executed, cannot be surpassed in any other language. But singers who are in the habit of practising in other languages will not sing those songs with such advantage as those who have studied declamation in English.

458. You think that Shakspeare, Spenser, and other poets of that time, furnish sufficient good English songs for singers to practise them?—If the words are set to suitable music. I admit many of the adaptations of English words to foreign music make not only the singer but the music ridiculous.

459. You consider that if an English singer is to sing before an English audience he will be better appreciated singing English than if he sang in Italian?—I am quite of that opinion.

460. You have spoken in your general reply as to the desirability of a certain independence of pecuniary considerations, so as to enable the utmost amount of musical aptitude to be cultivated on the one hand, and on the other hand not to be dependent upon an inferior quality of musical aptitude from the desire of merely making money by it?—That I feel very strongly from my own experience in the Academy.

461. You would not object to State aid being given to the Academy if it were put upon a satisfactory footing?—On the contrary, I think it would give dignity to the Academy to be under the auspices of the State. I think some fund which might tend to lessen the cost of instruction to students who could not afford to pay the present fees would be a great benefit to the country in a musical point of view.

462. You find that to be the practice in foreign academies?—I believe it is.

463. You have no objection to very eminent musical talent being educated gratuitously, as prizes?—On the contrary, I think it would be an advantage. If the scholarships in the Academy could be enlarged, I think it would be a great advantage.

464. You think if the sphere of its operations could be enlarged, through the good-will of the United Kingdom, it would be an advantage to the Academy; that is, if means were taken to educe from the country at large the greatest musical ability, and educate it more or less gratuitously in the Academy?—I think it would be a great advantage; but I think it would tell best if there were not a fixed number of prizes, but that under responsible discretion they should be more or less numerous, according to the amount of talent that presented itself at different times.

465. As you hold it to be necessary that the Academy should be able to pay its way, and as you also agree that it would be desirable to have some state assistance, it would be necessary to have a certain fixed amount, so that the Academy would be able to rely upon its income?—Yes; probably.

466. It would not do for the income of the Academy to fluctuate according to the accidents of very good or only middling class of students appearing year by year, because professors and staff are fixed, whether the Academy have many or few pupils; and if a system were devised by which the government should aid, that aid must be more or less of a fixed amount?—I have not considered that at present. I think, were the scholarships fixed at so many each year, it would be of great value to extend the number of free, or comparatively free scholarships.

467. You have mentioned the practice of church music. You would not consider it indispensable that a chapel should be attached to the Academy?—I think, without a motive, nothing is done in earnest; and few would give such attention to that class of music as is necessary for the proper execution of it, if they had not to prepare for the performance of the service.

468. The question goes rather to the contiguity of the chapel or church. Could not arrangements be made to perform the service in some neighbouring church?—I have made some such proposal as that; and Mr. Lucas, the present principal of the academy, having held the appointment of organist, had an opportunity of taking a large choir of academy pupils to his church to perform the choral service; and I know that system worked with great advantage to the pupils. There was afterwards a change in the arrangements, and the thing came to an end. As long as it continued it had a good effect in giving an interest in that class of music, and in introducing persons who sang with great credit to themselves into different church engagements. If a chapel were attached to the academy it might have a further advantage. There are several public institutions in London—the Foundling Hospital and others—where a considerable income is derived from the contributions of those who go principally to hear the choral part of the service in the chapel. They prefer that church to others because there is this addition to the solemnity of the service. If a similar plan were adopted in the academy the entire male and female pupils of the academy would be kept in regular course of practice for the purpose. I think a grander and worthier performance of the English church service could be presented than is done at present in any of our churches. I believe in the course of time that might tend to increase the respect for church music throughout the country at large, and an ambition to excel in it by those engaged in the practice of music. Great as is considered the importance of church music, it must be allowed that since the time of the first reformation English church music has not been of the first-class of writing; and the majority of musical talent in composition has been rather directed to the theatre and the concert-room than to church composition. I think, as the English Established Church has a service and music peculiar to itself, not available for the Lutheran any more than the Roman Catholic service, it would be the foundation of a good English school, and give character to the music of the country, if large opportunities were afforded for the practice of ecclesiastical music.

469. You would have Roman Catholic as well as Protestant students engaged in the church service?—If Roman Catholic students thought it desirable to take advantage of the musical education they must succumb so far, I apprehend, as to attend the practice of church music if it were established as part of the academy system. I believe it is the case at the present time, that in the majority of the Roman Catholic churches in this country, the large proportion of the professional singers in the services are Protestants; but conscientious scruples in the case of the academy I apprehend need not be violated.

470. With regard to the point you have mentioned—that you would suggest the songs of Handel as the basis of teaching in this class of music—do you not think, in advocating the establishment of choral services, taking Handel's compositions as the basis of English solo singing—such as "The Lord is King," "The Heavens are Telling," &c.,—it would be carrying the basis of instruction further than you contemplate?—Handel has written secular songs as well as sacred. I by no means think that the whole art of singing should be based upon singing words from the Old or New Testament. I think different impulses must accompany the declaration of sacred words and secular; still I say let English words be the basis of instruction, and still let Handel be regarded as the best model. I think it would be the general feeling that the rule of church choral service should not be solo but chorus singing. If there is solo singing to display any peculiar excellence it changes the service more or less into the character of a concert. Although occasional solo passages

occur, the singing of solos in churches is not the most desirable thing in ecclesiastical music, and does not present the best opportunities for the development of solo singing.

471. You have also alluded to a theatre in connection with the academy. You do not contemplate any extensive dramatic performance?—No, certainly; merely to the extent of having the shape and some of the accessories of a stage, which should make it more familiar to a person going into a regular theatre after having practised on this limited stage. It is the peculiar misfortune of persons in this country that they have no opportunity to practise for operatic performances with stage accessories until they come to that greatest of all ordeals, one of the large metropolitan theatres. In dramatic performances it is different. Persons go into the provinces first of all, and in most cases come to the London stage with the advantages of an apprenticeship in speech, stage action, and demeanour. But there is no operatic establishment out of London, and when that class of performance is given in the large provincial towns it is executed by successful London performers, who start with a London reputation to make them successful in the country. Debutants in the lyrical drama cannot acquire experience on the London stage in acting, demeanour, or dressing; which latter is a very important consideration. If students had the opportunity of practising stage music upon a stage it would tend greatly to prepare them for appearing on the stage of a theatre for regular performance. I believe it would be a great advantage, not only to the executants but to those in the academy who compose music to have it tried with the accompaniment of a stage and a limited amount of stage accessories.

472. Do you consider dresses and scenery necessary?—To a limited extent. Dresses certainly.

Reverting to the circular questions, Mr. Macfarren, in reply to questions 7 and 8, viz.:—

7. *Does the Royal Academy in any way promote the improvement of military music?*
8. *Could any useful connection be established by the Academy with the regimental volunteers or other trained musical bands?*

The reply was read as follows:—

7 and 8. The Academy has promoted the improvement of military music by educating several of the most efficient of the present bandmasters. It might yield far more important advantages in this particular could any arrangement be made with regimental band committees to send students to the Academy to be qualified for the office of bandmaster, under special arrangement in respect to fees, whose admission should be subject to their passing an examination as to natural capability, and also if applicants for bandmasterships were to be referred by those committees to an Academy examination as a test of their competency to the duties of the appointment. Under such an arrangement the Academy might easily accomplish—with its staff of professors, its orchestral practice, and its other advantages—all that was intended in the establishment of Kneller-hall.

473. Kneller Hall is still existing?—Yes; but I believe it has not succeeded in carrying out all that was proposed in its establishment. There are many things which distinguish concert and theatrical music from military, and the most important one is the fact that the moment one comes to play within walls, a delicacy is required which is not needed in the open air, and if members of military bands had the advantage of playing in an orchestra, so as to gain refinement, it would fit them for taking orchestral engagements, and many of them depend very largely upon those engagements for the chief portion of their income. When military bands come within walls it would be an advantage if some of the delicacy and refinement of orchestral performances could be given to the solo peformers, and they might acquire that more easily in the orchestra of the Academy than they could do only in association with wind instruments. I believe, in learning the duties of bandmaster, the opportunity of trial of compositions in the Academy would assist in the development of talent in the arrangement of music for military bands as well as for other bands.

Mr. Joule.—That observation is justified by the little experience I have had in hearing military bands myself. I think it would be a great advantage to the bands if the bandmasters were all equally aware of the difference between playing in a room and out of doors.

In reply to the circular question:—

10. *What is your opinion respecting (a) the advantages derivable from public concerts; (b) the test of musical proficiency by examinations; (c) the formation of a national musical library, and of a collection of musical instruments by gifts, loans, &c.*

Mr. Macfarren stated:—

10. *a.*—I believe that the sole advantages derivable to the academy from public concerts are, first, the initiation of the pupils into the difficulties of public performance, when their attempts are more leniently judged than they would be if made under any other circumstances; second, the publication of these pupils' claims to consideration for their talent; third, the affording opportunity to subscribers to observe the working of the academy. These advantages I believe to be so highly important as to render the continuance of the academy concerts imperative for its welfare, and the extension of their number very desirable. I am convinced that any endeavour to procure pecuniary profit to the academy from public concerts, would place the institution in antagonism to all the London musical societies, and to many members of the profession, and would involve it in very serious risk, if not loss of funds, while the excitement of preparing any extra or unusual performance would too probably dissipate the attention of the pupils from their regular studies.

10. *b.*—Examination is an imperfect test of musical proficiency, since its result depends no less upon the temperament than on the talent of the person examined.

474. For the admission of students you would have an examination?—Oh, yes.

475. And you would not object to examinations to prove whether the pupils were getting on or otherwise?—I think the more examinations within reason the better, so that professors and students might feel themselves under constant responsibility and inspection in the trust of development of talent; and an opportunity of showing the progress they are making would be an incentive to the ambition of both the pupils and the instructors: but when you speak of examination as a test, I think it is generally a very uncertain one. I have myself attended examinations, in which persons whom I have known to be superior have shrunk into the shade, for want of sufficient confidence and nerve to show themselves to the best advantage.

476. But you do not see persons of inferior ability come out well?—Not very often: but I have seen persons of inferior talent pass a better examination than those who had superior talent, but were nervous and diffident of their abilities.

477. That species of nervousness is not confined to musical examinations alone?—By no means.

Mr. Macfarren's answers were continued as follows:—

10 *c.* It is eminently desirable that the musical department of the library of the British Museum be rendered as extensive, as accessible, and as easy of reference as may be; but I fear that the establishment of another national musical library would not be worth the pains and money it would cost. A museum of musical instruments would furnish valuable material for future historical retrospect; but I see little present purpose that could be served by its collection.

478. Would you prefer that the musical library and

musical instruments now in the British Museum should remain at that Museum or be transferred to the Royal Academy of Music?—I think it is indifferent where it is deposited. It had better remain in the safest place, but I should like the pupils of the Academy and musicians at large to have facilities for consulting it. That advantage might be specially accorded to the students of the Royal Academy. A musical library to a certain extent, I think, is indispensable in connection with the Academy—a library of such music as is wanted for daily practice and for orchestral practice, and even some not generally accessible pieces for personal practice and study, which are not to be had at every music shop.

479. Are you aware of the facilities of access to the music at the British Museum?—I was very anxious when a student to consult some works of music in the Museum, and I obtained from Mr. Potter (then principal of the Academy) a letter of introduction to Sir Henry Ellis, on the supposition that one public institution would be recognised by another. He read the letter and replied: "The Royal Academy of Music; I know nothing of this; you must bring a letter from a proper person." The introduction in question was not regarded.

Mr. CHORLEY (who was present during Mr. Macfarren's evidence) said—I can relate very different experience personally. When Mr. Leslie and myself were engaged in preparing a "Judith," about five years ago, I heard that there was a "Judith," by Dr. Arne, in the British Museum. I wrote at once to Mr. Bond, the keeper of the MSS., and he gave me every facility by furnishing me with a catalogue; and I cannot conceive that anyone with fair pretensions would be denied access to that library. With regard to the ordinary library I am aware that you require a certain introduction.

480. Are you aware that the Conservatoire of Paris has received the musical library formerly deposited in the Bibliothèque?—I am not aware of it.

481. Are you aware that the same conservatoire has obtained a curious, not to say useful collection, of musical instruments of all periods?—I am not.

482. Are you acquainted with the musical museum at Edinburgh, formed by the late Mr. Donaldson?—Yes.

482*a*. And something of that kind you would think more or less useful to the chief academy of music of the country?—Yes, more or less.

Upon the question under head 10 *d*, on the subject of competitive trials, Mr. Macfarren stated:—

10. *d*.—I believe the competitive trials would provoke sore jealousies, and would be no real test of the relative merits of performers or manufactures, which can only truly be proved by the trial of time and the experience of the public. An examination may test a musician's knowledge, but cannot prove the extent of his higher artistic qualities.

5 (*Circular*). I think an union desirable between the Royal Academy and the newly-founded National College of Music, so that the interest in favour of the two institutions might be concentrated, and their common purpose thus more effectively realised.

483. Do you think there is a want in this country of opportunities for the proper exhibition of musical ability: and have you ever heard complaints on the part of foreigners coming to this country, that they are unable to get such an opportunity without great trouble, and have sometimes found it impossible to get that opportunity?—I have never heard of it on the part of foreigners. I think it would be well if such opportunities as the concerts of the academy afford for introducing unknown young English talent to the world could be increased in number. It is a very difficult thing for a young beginner to assert his talent to the world. If by appearing before the musical world as a student of the academy he could break through that dreadful ice which freezes up his powers, and insinuate himself into public notice, it would be a very great advantage to him; but fully developed talent, I think, will always find its way in the world.

[On the question of "the desirability of any union between the Royal Academy and similar schools, cathedral choirs, and local institutions?"—Mr. Macfarren stated, if chapel choral service were generally carried out, it would increase the opportunities of pupils in that course; but the work of cathedral choirs must always be local and have no reference to a common centre.]

484. But in case of an extraordinary voice being found in a cathedral choir, would it not be of advantage that that voice should receive the highest training possible?—Most decidedly: but he would have to leave his choir, and come to the Academy; and in that way the Academy could not co-operate with the cathedrals.

485. Could they not enter into such relations with the Academy that, when they found in a particular locality a youth of distinguished ability, they might promote his interests, and the interests of music, by sending him up to the fountain of best instruction?—Obviously: but I apprehend these cases would be rare, and so unfrequent as not to justify any general arrangements to that end. With regard to the College of Music, it pretends to the same aims as the Royal Academy. It is supported by funds, independently of the fees paid by the pupils, and more or less justifies its name of a national college. I think, when two institutions are working separately, there might be more or less evil from that opposition; and, if they were united, it might be for the benefit of both.

[A series of questions, propounded by Sir JOHN HARINGTON, were then replied to by Mr. Macfarren, as follows]:—

486. Are the pupils in the Royal Academy habitually taught in classes or singly? Will you state the advantages or otherwise of each of these two methods of teaching?—The pupils are nominally taught in classes. In the case of harmony, and also those of elocution and the Italian language, this plan is eminently effectual, because the attention of the whole class may be engaged by the professors in each separate exercise, and by explanations which may be equally available to all the pupils. I learn that, in other departments, it is found impracticable to draw the same advantage from class instruction; I think that even two pupils participating in the same lesson distract one another's attention, waste their time, embarrass the professor, and encumber the class-room.—To the above Mr. Macfarren added—That is a subject to which I have given a good deal of attention. I have personally inquired of several professors as to their experience in the working of class teaching, and I find invariably they have arrived at the conclusions I have stated with reference to class teaching. In a pianoforte class I do not see that any good is done by the pupils looking at another whilst he is taking—for instance—a lesson in fingering. In the majority of cases the system is cumbrous and inconvenient. I believe class-teaching in some of the foreign conservatoires has been more successful than it has been here. I have great reason for believing that it is not an efficient plan, and tends to inconvenience and loss of time on the part both of teacher and pupil.

487. Do you consider the present amount of instruction given by the Royal Academy sufficient to impart a complete education in each branch?—I think the present amount of instruction given in the Academy has proved its efficiency by its formation of many of the best musicians in the country. I think, however, that in some exceptional cases of singers, and, more rarely, violinists and wind instrument players, an extra amount of elementary instruction on the general principles of music might be allowed with advantage during the first terms of their studentship. I consider the following amount of instruction would constitute a complete musical education, if continued for a sufficient period, according to the natural qualities and previous attainments of the pupil. Two half-hour lessons a-week in any principal study. One half-hour lesson a week in any second study, except in the case of beginners named above, who require two lessons of 20 minutes. Two class lessons (of one hour)

a-week in harmony, except with the majority of singers, who need but one lesson, and further exception might be made from these in the above-named cases of beginners. One class lesson a week in elocution for singers. Compare this statement with my concluding remark of June 12th on No. 4 of the printed questions, urging the pre-eminent importance of every pupil studying the pianoforte, harmony, and an orchestral instrument, and participating in choral and orchestral practice; the practice of vocal quartets, trios, &c., and of instrumental concerted chamber music, each under a professor, is also desirable.

488. What in your opinion should be the average expense of providing a complete education for each pupil, considering the musical instruction alone as separate from the expense of the establishment?—This must always depend upon the various advancement of each pupil, and on the various fees of each professor. Also the average share in the cost of the orchestral and choral practices will be in an inverse ratio to the number of pupils, since the total expense must be the same, whatever their number. I think, however, using the broadest terms, that, at the present rate of professors' fees, 10 guineas per term may be an approximate average.

489. Do you consider the present fee of 33 guineas per annum paid by each pupil too high, and if so on what grounds?—I think 33 guineas too high a fee, because—firstly, many persons of most promising talent cannot afford it, and others pay it with great difficulty; secondly, as the fees of the Conservatories of Leipsic and Cologne amount to £12 per annum, as those for foreigners at Brussels are of a similarly low sum, and as other continental institutions are accessible either gratuitously or at a like rate of payment; and as, moreover, all these have the attraction of not being English, musical students rather seek their education abroad than stay at home to buy it so dearly; and thirdly, as studentship is free in the Royal Academy of Painting, musical students naturally desire a similar advantage.

490. Be so good as to make any suggestions which may occur to you in the foundation and practical working of a permanent Academy of Music in London?—The best suggestions I can at present offer for the plan of a musical academy are comprised in my answer to No. 4 of the printed questions, and No 4 of the MS.S. questions returned herewith. Let me add to these that I think if conscientious professors were engaged at fixed yearly salaries, they could better afford to make concessions in terms than they can upon the present chance of their services being needed for a longer or a shorter time, and the amount of their payment being consequently as precarious as in any private engagement. I believe that this arrangement would add to the responsibility, and, consequently, to the dignity of professorships. I believe, further, that while it is desirable to gather into the focus of the Academy the reputation of several professors in each department, the number of these should be so carefully limited, that, on the one hand, no professor of very great esteem should be excluded, and on the other, each should have sufficient pupils to justify his receipt of a considerable salary, and the professorships should be so few as to make their tenure an honourable distinction. The sub-professors, while pupils of the Academy, should receive no fees, since they would be indemnified by the honour of their appointment, and the experience it would afford them. A small reduction in the Academy expenses might probably be made through the above arrangement, while its sources of income might perhaps be extended by the attraction to the public of the chapel service, which, as it would be on a larger scale than any periodical celebration in the country, should be as productive, at least, as that of the Foundling Hospital, or any other institution; and also by the additional inducement to subscribers to the opera performances in the Academy theatre, and to the periodical lectures.

491. Your's is a very comprehensive view of the duties of the Royal Academy; you hardly think your plan could be carried out on their present premises?—Certainly not. I think that is not possible under any circumstances at the present moment, and there is great probability that they will have to leave the premises now occupied by them, under a notice from the owner, who requires them for other purposes.

492. In advocating a fixed salary to the professors you would have no objection to add to that some further remuneration coincident with the success of the establishment?—Of course. My notion about a fixed salary would be be more or less on this plan:—That each professor should engaged there for a certain amount of time—one, two, or three hours per day—that there should be a sub-professor, teaching precisely his system under his direction, and that attention at occasional periods to the progress of the pupils under the sub-professors should be part of the duties of the professor. As students left the classes of the professors their places should be filled up by promotion, so that the professor would always be engaged his one or two hours, or more, as the case might be. It would, to a certain extent, depend upon the accidents of the institution how much the professor was engaged, and how much he received. I think it would be an advantage that the preliminary instruction of the pupils should be confided to a sub-professor, under the care of the professor, and I think a good deal of time would thereby be saved to the principal professors if the rudimentary branches were taught by persons under them. I should wish to add, with regard to the government of the academy, I have stated in my written answers that I think the government should be professional rather than non-professional. I think that would be a great advantage to the academy.

493. By that you mean that all that is professional should be in the hands of professional parties; but you do not mean that the control of financial matters should be in the hands of professional parties?—Certainly not; nor the appointment or dismissal of the professors. It would be an onerous and graceless position I think for one professor to have the definite appointment or dismissal of other professors placed in his hands, and it would be more to the honour of the professors if they received their appointment at the hands of the most important section of the institution; but I think all technical matters of a professional nature should be in the hands of the professors—such as the classification of students, and the working of the academy generally.

493*a*. Are you in favour of monarchy or oligarchy?—I think it most rarely happens that a musician has such varied acquirements as would fit him for total responsibility. It is the case with the present principal that he has a very wide range of musical faculties, as he has a practical knowledge of most orchestral instruments as well as of the pianoforte; but it is not likely you could often meet with a person who has had experience in composition, in vocal music, in wind and string instruments, and in conducting an orchestra: and in case of any one not having all these qualifications, it would be of great value if he were assisted by a staff of some five persons, forming a board of professors representing each department, and I think that would work well in respect of acts of authority over the other professors, which might be more or less repugnant to an individual professor; but if they were the mandates of the board, there would be no such personal obnoxious feeling.

494. You are not in favour of the practice of the French and other academies, of having a principal, so to speak?—I would have a principal in conjunction with a council, or board of management.

495. With co-equal jurisdiction?—Let the principal have the privilege of giving the casting vote. I think it of great value that the principal should be on permanent duty during the business of the Academy, and that there should be periodical meetings of the board of management with whom he was associated, but that he

should not take upon himself individually so serious a matter as the dismissal of a professor, for instance.

496. To whom would you confide the internal discipline of the Academy?—To the principal entirely.

497. You would have a principal with larger functions than any one professor possessed, and who, under certain circumstances, should take the advice of a board of professors?—Yes; that is what I mean.

THE CATTLE PLAGUE IN THE LAST CENTURY.

The following is a reprint of the article* on this subject referred to in the chairman's address at the opening of this session:—

(Continued from Page 109.)

As the mortality of cattle occasioned by the murrain has been a very great evil to many countries, means for the prevention or cure of it have been earnestly sought after by great numbers of physicians and others. But this research has been made with very little success anywhere, either with regard to the interest of the proprietors of the cattle or benefit to the public,† except what relates to the introduction or spreading of the infection into places or countries free from it.

Among the means of prevention of the murrain those the most generally adopted, though the least effectual to the end, have been the attempts to render the places where beasts are kept, or the beasts themselves, insusceptible of the infection. In this intention, by an imitation of what the ancients recommended and practised as preservatives against the plague, fumigations, scents, and external medicaments employed on the cattle have been almost everywhere used.

With respect to fumigations of the places where beasts are kept, all confidence in them must fall to the ground whenever the opinion of the air's being a vehicle of the contagion is refuted, as they were performed with a view to destroy the putrid effluvia with which it was supposed to be impregnated, and which was considered as the matter of the contagion. But these fumigations frequently repeated, as they were for this purpose, in close places where the beasts were confined, were not only ineffectual to that purpose, but noxious in a considerable degree as being conducive to the prevalence of the contagion. For, being in general made with bodies that afforded an acrid steam, such as sulphur, vinegar, tobacco, or terebinthinate substances, they injured the respiration of the beasts, and thence, diminishing the animal strength, rendering them more disposed to be affected by the contagion.‡ A multiplicity of facts confirm the truth of this remark, as it appears from nearly all the accounts given that the greatest number of beasts have been lost where means of this kind have been most employed.

The medicating the cattle externally by rubbing them with sulphur, gunpowder, tobacco-water, and other substances does less harm than the fumigations, but not more good, as experience has largely evinced. The same may be said of those extraordinary mundifications, or cleansings of the hair and skin of the cattle, which have been recommended and practised on the same authority of the ancients. There is reason to conclude that the contagion, in whatever part it is first imbibed, takes effect too soon to be rubbed off in time; and it is most reasonable to suppose, if the infection be at all absorbed by the skin, this great cleansing of it may fit and prepare it to receive the contagion rather than defend it against its admission. All the supposedly preservative methods of this kind, though they have the authority of many writers from an implicit submission to the more ancient, have been found as vain and fruitless in practice as they seem absurd in speculation when examined on the just and demonstrable principles of physiology.

The use of the internal medicines, administered as antidotes to fortify the beasts against the attacks of the contagion, have been equally inefficacious or detrimental with the external means. Those of the medicines that have been recommended for this purpose, which come within the class named alexipharmic, and are proposed to combat the virus, are entirely inadequate in their degree of power to the intention, though some of them, by their invigorative qualities, may have a tendency to oppose the effects of the contagion. Those which have been adopted as antiseptics or resisting putrefaction, such as sulphur, oil of vitriol, vinegar, &c., when given as preservatives against the contagion, must of course be administered out of season. Since putrefaction in the fluids of the beast is the consequence, not the cause, of the contagion, and, therefore, cannot take place till the contagion be received, nor, as it did not before subsist, can it admit of being counteracted till then. Moreover, the substances of this kind, which are of an acid nature, have, in this case, a contrary tendency to that of resisting the effects of the contagion. For, destroying the bile, and checking, by other means, the digestive ferment, as well as lowering the *vis vitæ* from some other less known power, they weaken the habit of the beasts, and consequently dispose them to receive the infection more readily, and suffer, with less resistance, its action in bringing on a putrescent state of the fluids. It has been, therefore, everywhere found that, whenever any of these methods have been pursued, more beasts have been lost than when they were left to the friendly assistance of nature undisturbed, and only secured from these accidents that would injuriously affect their health in all circumstances.

There is another proposed method of saving cattle from the mortal effects of the murrain, of which some trial has been made, that properly comes under consideration along with the preceding. Because, though it is not, indeed, the preventing the infection, but, on the contrary, the giving it, yet it is calculated to answer the same end, that is, the preventing the ill effects of the contagion by anticipative means. This method is the inoculation of the cattle with the murrain, in the same general manner as is practised with mankind for the small-pox. The fact is well known that beasts which have had the murrain from accidental infection, like mankind with

* The paper is entitled "Observations on the Murrain or Pestilential Disease of Neat Cattle: the Means of Preventing the Infection, and the Medicinal Treatment of the Beasts when seized with it," and is by Mr. Robert Dossie. It is extracted from his "Memoirs of Agriculture," Vol. ii., 1771.—ED. *J.S.A.*

† The enumerating the various methods hitherto tried for the prevention or cure of the murrain, though they were attended with so little success, may yet be very beneficial, in order to deter from the future vain trials of, or dependance on them, in case, as there is too much reason to dread, the disease should be again brought into our country. For by knowing they are of no avail, though recommended by writers the most likely to be consulted, much needless trouble and expense may be saved, and the public attention transferred from them to more rational and efficacious means, by showing they ought to be exploded as well on account of reasons drawn from just speculations as a large actual experience of their failure.

‡ A free respiration of fresh undepraved air is essentially necessary to the strength of the beasts in order to their resisting the effects of the contagion. It has appeared, from a number of observations, which are recorded by the writers on this subject, that the cattle which have been kept out in the air, when the weather was not inclement through too much cold or moisture, have been less subject to take the infection, and recovered in greater numbers when seized with it, than those which were housed. In Denmark, during the terrible visitation mentioned above of this disease in the year 1759, many of the boors attempted to preserve their cattle from the infection by the fumes of tobacco, which they continually smoked in the cow-houses, even sitting up the whole night in turns for that purpose in the midst of them. But it was remarked that scarcely any of the cattle so treated avoided the contagion and death in consequence of it.

regard to the small-pox, do rarely take it again; and it being presumed on this ground that the analogy betwixt these two diseases still holds good in other particulars, and, consequently, that the communicating the murrain by inoculation would have the same consequences on the cattle in preventing their receiving the infection again, and in rendering the symptoms of the disease proportionably milder and less fatal, it was imagined the use of this method might be, in a considerable degree, a substitute for a preservative from the infection itself. But experience has evinced that this presumption was erroneous in point of fact; and there is besides one essential circumstance of difference betwixt the murrain and the small-pox which constitutes the use of inoculation detrimental in the former, even if it were productive of the same consequence as in the latter with respect to the mitigation of the symptoms or the prevention of future infection. The experiments made to explore the effects of inoculation in the murrain, though not all alike in their result, have yet given sufficient lights to determine that they are very different from those of inoculation for the small-pox, and that it can in no degree answer the same end, even with respect to the particular beasts subjected to it, much less can it conduce to the restraining and diminishing the mortal effects of contagion in any manner that may be beneficial to the public.

In the first place, it is sufficiently proved from instances that the inoculation of beasts for the murrain does not hinder their receiving the infection again, as other cattle, by accident. This may seem very extraordinary on the first view, because, when the cattle take the infection by casual means and recover, they are rarely subject to have the disease a second time, and because we see inoculation for the small-pox prevents the ill effects of future contagion in the same manner as a casual infection. But reasons drawn from analogy, however just they may be in support of supposition, cannot conceal facts; and though the cause of this difference betwixt the small-pox and murrain be of a dark and inexplicable nature, yet nothing is to be thence inferred against its reality as the subject itself is so in all respects. For there has been no satisfactory reason hitherto assigned why the having either of these diseases once, by any mode of infection, should be preventive of the future effects of the same contagion. Whatever difficulties may attend the accounting for it, we yet find on a revisal of the relations of the trials of inoculation practised for the murrain, a considerable number in proportion to the whole are known to have actually taken the infection afterwards, and that of these the far greatest part died of the disease.* We may reasonably presume thence that others of them might take the infection after the accounts were written, or under circumstances which might prevent the writers from attaining to the knowledge of it. It must likewise be considered that among the beasts inoculated a part must have been such as were not constitutionally susceptible at all of the infection by casual means, and therefore did not take it afterwards on that score. But, if we reason on the simple fact alone, that a considerable proportion of the number of the beasts inoculated have had the disease again, and with at least equal violence and mortality as those not before inoculated, we must grant that this practice cannot any way answer the end proposed, which is solely that of preserving them for the future against the bad effects of the contagion.

In the second place, it is likewise evinced by the same testimony of facts that the infection communicated by inoculation is not attended with less violent symptoms and mortality than when received by casual means. The accounts of the practice of that operation fully justify this assertion.* Hence, therefore, as well as for

* There are many instances of cattle taking the murrain a second time after having just before had it by inoculation. Noseman, and two other Dutch physicians, were among the first who performed this operation in Holland. The beasts they inoculated were seventeen in number, and out of them three recovered, but took the infection again by accidental means a fortnight after in so violent a manner that two of them died. Professor Grashuys inoculated six beasts, which recovered. All of them took the infection again by accident and four of them died. There is an account, in the experiments of the Marquis de Courtivron, of two calves that were inoculated twice without any apparent symptoms of the disease being produced. But they took the infection without any operation afterwards from other cattle having the disease from inoculation, and one of them died. In an experiment made last year on the inoculation of cattle for the murrain, in consequence of a subscription formed for that purpose in Friseland, and reported to the States-General of the United Provinces by Professor Camper, it appears that out of ten which recovered after being inoculated the 5th of July, five took the disease again by accidental means, and all died. In the continuation of the above experiments, seven beasts which recovered, after being inoculated July 20th, all took the infection again casually afterwards, and were carried off by the disease. It may seem difficult to conceive why more of the cattle that have recovered from inoculation, and taken the disease afterwards, should die of it than of those which have not been inoculated, and are casually infected with it. But as inoculation does not, similarly to what is found in the small-pox, prevent the future action of the contagion with equal power, nor render the symptoms less violent when the disease is received by that mode of infection, than when in the natural way, there is room to conclude that the weakened habit of the beast, in consequence of the injury done by the disease in the inoculated subjection to it, renders the effects more fatal in the second attack according to the principle we have above specified.

* There are many instances, in the relations given of the trials of inoculation for the murrain, of the beasts dying in a great proportion to the number subjected to it. Amongst them are the following:—Noseman and his two colleagues, as we have before had occasion to mention, inoculated seventeen, of which fourteen then died, and two of the others, which had recovered from that infection, took a fresh one casually, which appeared stronger, and carried them off. So that only one was saved out of the seventeen. Doctor Fountayne, Dean of York, had four inoculated, and lost one of them. Doctor Layard inoculated eight beasts, of which five died, and he killed another for inspection, which otherwise might have been added to them for anything that appears. Four beasts were inoculated for the murrain in the spring of the year, by order of the States of Utrecht, all of which had the distemper with great violence and died, as appears in the report made to the states of that province of the opinion of some eminent physicians they consulted, and of the result of this experiment. The following numbers died from the inoculation performed in consequence of the subscription mentioned in the preceding note, made last year for that purpose in Friseland. Out of twenty five head of young cattle inoculated the 5th day of July ten died, besides five others which, though they recovered, took the disease again afterwards casually, and then died of it, as before related. Out of twenty-five that were inoculated the 20th of July thirteen then died, besides the seven beforementioned, which, having recovered, caught the infection by accidental means afterwards, and were carried off by it. Out of fifty-eight that were inoculated the 9th of August and took the infection, twenty-five died of the disease then, and five more died soon after of a pulmonic decay occasioned by it. Four other beasts were inoculated on the same 9th of August, in which the infection failed. They were again subjected to the operation, the 18th and 19th, in a similar manner, and, taking the disease then, two died at the time, and a third soon after, from pulmonic abscesses brought on by it. In these instances taken together we find a far greater proportion of the cattle destroyed by the murrain given by the inoculation than would have been by the infection taken in the natural way. Professor Camper says, nevertheless, "That such ill success should not discourage the future pursuit of inoculation for this disease, because the same miscarriages happened on the first introduction of this operation for the small pox into our parts of the world." But I must beg his pardon for saying that this is an inadvertent assertion, and that he is entirely mistaken in the matter of fact. For the inoculation for the small-pox was equally successful at first as now; and though extraordinary stress has been lately laid on some particular methods of treatment supposed to be new, yet, where they have not been followed, we have two instances of a greater list of recovered patients in

the last-mentioned reason, inoculation appears evidently to fail of its intended purpose.

The total insufficiency of inoculation to answer, in the case of the murrain, the end proposed, on the score of both the preceding circumstances, would be a sufficient ground for exploding the practice of it. But there is a yet stronger reason against its use, which arises from this principle :—The murrain is, at least with respect to the European countries, an epidemical disease, though contagious. That is, it does not, as we have observed before, ever reign but when certain unfavourable circumstances of season have created a predisposition in the cattle to receive the infection, and thence rendered them temporarily susceptible of it. When the effects of these unfavourable circumstances of season cease the effects of the contagion cease likewise, as far as regards accidental infection; so that when the consequences are left to the natural course of things, this disease is only a temporary mischief, to which there is some certain period,* though that period may be different, as we have seen above, from the various condition of different places. Now, if the inoculation for the murrain were practised in so general and continued a manner as to render it of any public consequence, supposing the inoculated beasts incurred less danger from the disease by that mode of receiving the infection, and were more secure from future attacks of it, the contagion must be spread in proportion to the extent of the country where the operation is practised, and must also be constantly kept up in good as well as bad seasons. Hence all the natural means of the contagion being exterminated in the favourable times would be wholly taken away, and in the bad times there would be necessarily a great destruction of such beasts as neglect or the casual want of opportunity of inoculation had left exposed to the rage of it. This we see happen at present with us, in the instance of the small-pox, from the very extensive dissemination* of the infection by inoculation. But this disease differs very materially from that of the murrain with relation to that operation. For we find no instance of the contagion of the small-pox being ever totally suppressed in any country where it has once gained admission; and therefore, if general inoculation mitigate the effects, it may be adopted for that disease without the mischief of causing a perpetuity of the contagion, as would happen from a general practice of it for the murrain, the contagion of which will otherwise spontaneously cease in certain periods, as past events have incontestibly manifested.

The failure of inoculation to answer its intended purpose, as evinced by the instances above quoted, and others, has disposed the favourers of it not to insist on its utility when practised on cattle in general. But Camper, De Monchy, and some others of those who have most lately given opinions on this subject, still continue to recommend it to be performed on calves, or young cattle. But even admitting a greater number of them than of older cattle, might recover, when subjected to it, yet, if it be not, as we have above shown, good reason to believe, a security against future infection, it can be of no utility. The objection, moreover, against the general use of inoculation, with regard to its spreading, and perpetuating the contagion, avails equally against the inoculation of the calves, as the adult beasts. For what will secure the other cattle from this infection, when the calves have the disease in places near them? Will not this universal propagation of the contagion, in spite of all the care that can be taken, of course occasion its frequently reaching some of the older cattle; and will they not infect each other the same as at present, only in a more general manner? It may be answered that, if all the calves be inoculated, the whole stock of cattle would in time be rendered insusceptible of the

proportion to those which have been lost under the same conduct, than can be produced on equal authority by any of the pretended improvers of this practice. Some few out of great numbers have at all times died of inoculation for the small-pox, but never in any proportion to the beasts, which appear in the relations here cited, to have died from inoculation for the murrain. It was the striking examples of success which could alone have introduced and established the use of inoculation for the small-pox here, and it would have been rejected with horror, and prohibited by authority, had a similar failure to that which has been experienced in the murrain been found in the result of the first trials.

* Professor Camper and some others of the Dutch physicians have given it as their peremptory opinion that the murrain will not cease entirely again in their country, but, like the small-pox and measles, only abate its violence, and confine itself to particular places in favourable seasons. The professor says, in one passage of his printed essay, "That it is more than probable this contagious disease is become as permanent as the small-pox and measles." But certainly this notion is very erroneous, and contrary to a rational and just deduction from facts. There are no parts of Europe which the murrain has been known to have ever invaded, that have not been known at other times afterwards to have been again free from it. A considerable stress may be properly laid on the more ancient visitations of many places of which we have accounts, whence it must often have gone away, as there were no traces of it found afterwards in them. Why, then, if there be anything in the nature of the contagion that renders it capable of establishing itself permanently, has it not been found to have done so in some place or other? Yet no such place is known where this murrain has always subsisted from a considearble time backwards to the present. Even the United Provinces themselves, where the contagion having now maintained itself for a number of years last past, has given occasion to this apprehension of its having become pe petual there, was become again clear of any remains of that infection, which was brought into the country at the general diffusion of it over all Europe about the year 1713, and continued its force there till about 1721. It will be allowed that not the least marks of this disease appeared during an interval of near twenty years. till it again was brought by a fresh contagion about the year 1742, which can be traced to have come from a very distant part of Europe, and passed through the same countries as the former contagion of 1713. The professor himself acknowledges these facts in other passages, and includes the United Provinces in the parts of Europe where he says it was no more heard of till 1740. Now, if after raging so violently in the United Provinces in 1713 and 1714 as to carry off 40,000 head of cattle in less than two years, and keeping its ground for more than seven years, it then entirely ceased, if it has, moreover, ceased in like manner at various periods in every other place where it has been known to have subsisted, what reason can we have to conclude that it will now be perpetual, or, to use the professor's own expression, permanent, like the small-pox and measles, which have never been found to quit any considerable tract of country once infested with them, though some small districts may be at times exempt from them. The present extraordinarily protracted continuance of the murrain in Holland is easily to be accounted for from a longer series than common of unfavourable seasons, conspiring with the great relaxation natural to the cattle in so damp a country, which has kept them in a state susceptible of the infection, at the same time that in other neighbouring countries of a better temperature this predisposition to the disease has not equally prevailed. But this peculiarity in the state of the seasons must nevertheless undoubtedly have some period and, consequently, the prevalence of the contagion. The effect must cease in the United Provinces as well as in other countries along with the cause, as it has manifestly always done before, and the disease therefore cannot be presumed to be rendered perpetual, or permanent as the small-pox or measles, unless the continuance of the unfavourable seasons, such as have succeeded each other since the year 1740, be previously presumed to be rendered perpetual, which is against the course of nature, as displayed in all preceding times.

* It is certain, from a very attentive examination of this matter, that a far greater number of persons have died of the small-pox in England within the four or five years last past than have ever been known within a like period for a considerable length of time. The inoculation of numbers in almost all places has diffused the infection through every corner of cities and large towns, and the itinerant practitioners of the operation, have conveyed it into every village of the country, even some where it had scarcely before ever been known. By this means, all persons susceptible of the infection having been exposed to it during a bad epidemical conjuncture many have of course taken the disease and been carried off.

infection, and therefore not subject to this mischief. But if, which is, nevertheless, denied, for the reasons before specified, the inoculated cattle were rendered incapable of having the disease again, yet the detriment arising from the above explained effects of such a practice, before it could possibly be extended in any general manner, and the impracticability of making more than a part of the people conform regularly to it; would be extremely great. This plan has, besides, the further inconvenience of being incompatible with any supply of foreign cattle in places of great scarcity.* for the contagion being spread everywhere by the constant inoculation of the calves, such foreign cattle would of course be affected by it, which must produce such a loss to the dealers in them as would deter any persons from venturing on so dangerous a trade, whence the public distress would be greatly inhanced by the scarcity of all cattle thus occasioned.

We may, on the whole, conclude that no general effectual aid is to be obtained against the murrain, in a preventive intention, by medicinal means. For such as might avail to a certain degree in nature are rendered impracticable from economical reasons. Whatever is done of this kind to answer any real purpose, must be extended to all the cattle in every stock, at least, where there are not very particular signs of strength, which will be found only in few. It must also be continued, or at least renewed at short invervals, during the whole time the infection is in the neighbourhood, as no foresight can point out when accident may convey it to the beasts. This must cause much expense in the purchase of the medicines, and constant trouble in the administration, which is in fact equal to expense. Professor Camper says, nevertheless, that nothing affords a greater prospect of success than preparing the humours while the cattle are yet in health as the contagion approaches. But he seems aware, however, that the medicine which could be most depended upon for this purpose, the Peruvian bark, would be too dear to be administered in that profusion which is necessary; and therefore he proposes the finding some substitute for it, intimating that he considers the willow bark as such. But, unhappily, it is well known that neither the willow bark nor any other hitherto discovered simple is an adequate substitute for the Peruvian bark, and, though they have a degree of the same power, and may be joined with it to make some saving of the quantity, yet, given alone, they are not to be depended upon and deemed equal to the intention. The expense of the Peruvian bark, or of strong fermented liquors or cordials, the only efficacious means of invigorating and keeping up the sanative strength of the beasts, would be apparently more burthensome to the proprietors of cattle than that of replacing such of them as might be carried off by the disease. Since to put a large herd of cattle under a medicinal regimen, and continue it so for a long time, would most obviously be attended with a certain great loss for the precarious chance of avoiding another loss that, at worst, could not be equal to it, nor possibly incurred at all, and would therefore be neither advantageous, nor in general practicable, as many proprietors of cattle could not find resources for making so considerable a disbursement.

The remedies which have been tried for the cure of the murrain have been in general as inefficacious and absurd as those employed for its prevention; and though some few have been better chosen with respect to the intention, yet they never appear to have been well used as to the manner of administration, whence we have very few certain instances of their success. The far greater part of these medicines, like those used for the prevention of the disease, have been taken up on the authority of the ancients and the earlier writers, and consist of a jumbled variety of those medicaments which are deemed antidotes of poisons or alexipharmics. Under this class have been given theriaca, mithridate, diascordium, opium, camphor, balsams, frankincense, myrrh, juniper berries, camomile flowers, marigold flowers, feverfew, rue, sage, fenugreek, madder roots, grass roots, horseradish, bay leaves, mustard seed, snake root, contrayerva root, turmeric, savin, moth mullein, spearmint, calamus, aromaticus, garlic, onions, leeks, testaceous powders, sulphur, vinegar stalks, honey, raisins, figs, blood of a tortoise, and eggs.* Some present physicians on more modern, but perhaps not more just notions, have exhibited to the beasts several of the above and other simples, under the name of antiseptics, in another intention; it is that of resisting putrefection, in which they principally place the cause of this disease. The chief of the remedies of this class they have adopted are the vitriolic acid, vinegar, verjuice, four dough, butter-milk, common salt, and sal ammoniacus.† Others, who are attached to the doctrines of another modern school, considering this disease as inflammatory, have administered medicines they hold as emollient and sedative, of which nitre,

* The want of a recruit, from other places, of the stock cattle has been so great in Holland that the destruction of the breed, and an extreme great scarcity of provisions must have followed if there had been no supply of foreign beasts. At present there is a most visibly deplorable deficiency of the stock, notwithstanding the great numbers which have been lately brought from Holstein. This circumstance alone is a sufficient objection to the proposal of inoculating calves; as such a stock, as could be thence raised, would by no means be adequate to the consumption, and the limitation of it would render the price of beasts exorbitant and burdensome.

* The notion of the nature and properties of antidotes was very vague and void of scientific principles in the ancients, and the choice of their medicaments of that class were accordingly, in many instances absurd and incongruous. The general idea of what were called alexipharmics was more rational and just, but the particular medicaments adopted in this view were, for the most part, very inadequate to the intention, even in slighter cases, and very injudiciously combined with each other in the compounds. It is not to be wondered at, therefore, no remedy against so malignant and violent a disease as the murrain in cattle should be found amongst those of this class proposed by the ancients or their followers.

† The antiseptic class of medicines has not much more claim of propriety and efficacy in the cure of the murrain than that of the antidotes and alexipharmics. Though a putrescent state of the fluids be the consequence of this disease in the second stage when the effects are violent, yet it does not seem to have any concern in the cause, nor from any marks even to come on in the first stage. The effectual method, therefore, of doing somewhat that may resist the putrefaction is to mitigate the violence of the disease, which can only be effected, as far as hitherto appears, by keeping up the natural strength of the beasts, through the use of an invigorative regimen. The action of those remedies called antiseptics may be therefore well doubted, as we shall have occasion to take notice more particularly below, with respect to their immediate effects in that intention in any febrile cases, and more especially in the murrain. Notwithstanding they check putrefaction in inanimate animal substances, yet, in living subjects being taken into the intestines, their nature is changed by the digestive operation, and they do not pass into the habit with the same qualities, but as a part of the chyle in which such qualities cannot exist. Those of them that contain the astringent gums which have the property of tanning, such as are found in the Peruvian bark, &c., may promote this intention indeed secondarily by invigorating the solids, accelerating, consequently, the motion of the fluids, and thence aiding the natural ferments, which are the cause why putrefaction does not take place in the juices of the living animals. But the acid kinds of the antiseptic medicines have even the contrary effects in febrile cases. For, diminishing the irritability, they lower the *vis vitæ*, and they prevent digestion by checking that particular ferment by which it is performed. Whence, in both ways, they lessen the animal strength, and of course conduce to the putrescence of the humours. These antiseptic remedies moreover can have no effect on the habit in that stage of the disease where the putrescence actually takes place. Because the digestion is then totally lost, as we shall see below, and the medicines, when taken, either remain in the stomachs of the beasts, or passes off in the colliquative purging. It is thence we may account for the greater mortality of beasts so treated.

cream of tartar, acids, mucilages, and oils are the principal.* Mercurialis, antimonials, and white vitriol have also been employed in the intention of febrifuges by some of the present physicians, who are favourers of chemical and metallic medicines.*

But alike has been the success of all the proposed remedies of these several classes, which is, that a remarkably great number of the beasts to which they have been administered have died, in proportion to that of those which have been left to nature. This may appear strange, but the fact is that all of these medicaments which have any operation, except those which have an invigorating and strengthening quality, disturb, in some way or other, the animal economy and, thence weakening the beasts, render them more subject to the malignant action of the contagion, according to the principles above laid down.

The Peruvian bark, strong fermented liquors, cordials, and other medicines which have the same tendency to invigorate and are thence, as will be shown below, agreeable to the true indication of cure, have, amongst the rest, been tried by some few physicians in their treatment of this disease. But the manner in which they were used, either with respect to the period of the distemper when they were given, the want of due perseverance in the exhibition, the joining to them injurious practices, or some other circumstance, has been such that few instances of good can be shown to have resulted from them, though enough to confirm what may be deduced from just principles of physiology respecting this disease, as to their utility in the cure of it.

(*To be continued.*)

* How far the notion, that the mortal effects of febrile disorders in general depend on inflammation, and that the indications of cure are to be thence deduced, may be just, does not make a proper object of examination here, though, perhaps, a medical error in this point has not only been destructive to many cattle in cases of trials to cure the murrain, but to a greater number of mankind than were ever saved by all the means of medicinal art. But however that may be, it is obvious the murrain cannot be classed amongst inflammatory disorders when the symptoms of it, that will be below investigated, are duly considered. It must be allowed, indeed, that when the whole animal economy is perverted by this distemper in the second stage of it, the efforts of nature to relieve herself from the discrasy of the fluids, produce inflammation in particular parts, the marks of which are constantly found. Inflammation is not, however, in the murrain, even the secondary cause of the disease itself, as it is in the small-pox, plague, and some other febrile contagious distempers of mankind, but the last consequence of it in the most advanced state. On the contrary, the symptoms of the first stage of the murrain and frequently of the second exhibit no signs of general inflammation, but of general and partial weakness. A lentor of the animal action, a stupor and a paralysis of the head and digestive organs are, as we shall see below, the first visible effects. When these are aggravated so as to prevail over the efforts of nature to perform the vital functions, the disease necessarily proves fatal; but where the animal strength is sufficient to resist for a certain period the disease terminates by a critical discharge of the virus or morbid matter, and the beast recovers. Certainly, therefore, the treating the murrain as an inflammatory disorder by the exhibitions which diminish irritability, and lessen the *vis vitæ*, or animal strength, is conspiring with the efforts of the contagion to bring on the destruction of the beasts as those efforts prevail according to the weakness of the subjects. It must be admitted, indeed, that the medicines administered in this intention are not very powerful in their effect, but when conjoined to bleeding or other evacuations, they have some share in rendering nature unable to resist the action of the contagion. They may consequently be granted to have contributed in some degree to that remarkable loss of the cattle which has attended the attempts to cure the murrain.

* The trials of mercurials as specifics for the murrain were suggested by their efficacy in the venereal disease, but perhaps in some others which are contagious. But it does not appear, from any observation on facts occurring in the trials made on it, to avail in the murrain. Indeed, had it been of more virtue in this disease the effects of it, in the manner it has for the most part been administered for the same, must have been but slender. In the æthiops mineral and cinnabar, which are the preparations used, the mercury is so clogged and locked up by its combination with the sulphur that its action is weak and precarious. As far as can be concluded by analogy the antimonials might possibly have had some effect in this disease if the proper kind had been administered on the first appearance of the symptoms. But at the time these medicines seem most to avail in fevers of the human kind, that is in the last stage, they cannot possibly be of any service in the murrain, because the digestion is then, as we shall see below, entirely lost in all the particular subjects which would not recover without any aid, and the medicines must therefore with them lie inactive in the first stomach or cud-bag without passing further.

THE ROYAL ACADEMY OF MUSIC.

The following is from the *Pall Mall Gazette* of the 8th January:—

The reform of the Royal Academy of Music is too important a matter to be dismissed in the brief paragraph in which we have already called attention to the question. Considering the vast influence of the musical art on the enjoyment of daily life, its humanising and elevating influence upon the poor, and its importance as an expression of religious emotion, it is surprising that the position of its teachers should attract so little attention. This singular indifference is probably due to the fact that so few men of the middle and upper classes have any practical knowledge of music, or were taught to sing or play while yet they were boys. Consequently, whatever may be their love for musical performances, and their conviction of the general importance of musical cultivation, they feel themselves unequal to pronounce any sound judgment on proposed measures of musical reform, and content themselves with the old lament that they were not taught music when they were young. To some such causes, too, is to be traced the doubt whether the supply of a musical education to embryo teachers is a thing with which Parliament, as representing the nation, is in any way concerned. Why should we pay for teaching boys and girls to fiddle and sing, it is said, any more than to make shoes or to bind books? What has the nation to do with the cultivation of fine voices or striking aptitudes for playing on the pianoforte. We might as reasonably, it is argued, undertake to set up a national academy for teaching young dancing-masters or "professors" of gymnastics and fencing. The answer, however, is obvious and simple. The principle on which the nation is justified in taking up the question is identically the same as that on which it endows Regius Professorships at Oxford and Cambridge, and generally grants money for educational purposes for the benefit of rich as well as poor. Once grant the fact that the cultivation of music is a material element in human well-being and happiness, together with the principle that the State is called upon to assist in the work of education, and the establishment of a national Academy of Music follows as a matter of course. If the parents of boys and girls who are intended to live by teaching music cannot secure them a fit training, the loss is that of the whole nation at large. The fact that the parents of such children and the children themselves are incidentally benefited in no way does away with the additional fact that the nation at large is a gainer also. We do not make grants to poor schools for the benefit of the schoolmasters, but for the benefit of the children. And when in like manner we pay musical professors to teach other embryo musical professors, it is not for their sakes that we do it, but for our own. We see that the musical teaching power throughout the country, like the performing powers of players and singers, is at a very low ebb. From the cathedral services and great oratorio performances down to the humblest attempt at drawing-room or poor-school singing, the condition of English music is below mediocrity. Not one "professor" out of a dozen is in any sense of the word a real musician. In not one

church in a dozen is the congregational singing endurable. There is not a single theatrical orchestra in all London which plays the accompaniments to songs and duets with a proper delicacy and finish. English operatic singers, with very few exceptions, are a proverb for incapacity; mumbling their words, deficient in execution, soulless in expression, and as guiltless of "phrasing" in measured music as of declamatory life in recitative. Everywhere there is that same want of *thoroughness*, which indicates a deficiency in early education.

When the Royal Academy was set up, enthusiastic but not far-seeing patrons imagined that they had devised a cure for all these evils. But the establishment has never won a name in the musical profession or outside it, and has never done anything to deserve a name. It has turned out one good composer, Mr. Sterndale Bennett, and one eminent singer, Mdme. Sainton-Dolby; and that is all. All our other best English singers and players were trained elsewhere. Nor is this to be wondered at. The management of the institution is scarcely to be called management. Nobody who teaches is properly paid, and nobody is properly supervised by anybody. The whole affair shuffles on, as it were, of its own accord, in an inconvenient house in a street leading out of Hanover-square, of very questionable character as to the persons who at times make it their promenade. With all this the musical teaching given is far from cheap. The professors who teach, or who profess to teach, but are given to teaching by deputy, are understood to be moderate in their charges. Nevertheless the average cost of each pupil is about £45 a-year—an enormous sum, more than the cost of tuition at many colleges at Oxford and Cambridge, and doubly enormous when the very unsatisfactory quality of the teaching is taken into account. During the year 1864 the mere arrangement of the academy, including rent, salaries of secretary, librarian, &c., exclusive of the payment of teachers, amounted to more than £950. There are now only seventy-two pupils; so that each of the pupils costs £13 a-year, in return for the use of the rooms and music belonging to the institution; while the cost of tuition is wholly paid by the pupils themselves. And all this is exclusive of the personal clothing, board, and lodging of the pupils, with which the academy has nothing to do—a regulation, indeed, which is about the most sensible arrangement that exists in connection with the whole affair.

Considering, then, the present social position of the ordinary musical professor, and the average income that he earns by his labours, it is clear that any real advance in his training must come from the Government of the country. The system that has been adopted in reference to schools for general education must be adopted for the education of musicians. We want a Kneller Hall, as it used to be, in London; a normal school, as it is now the fashion to call such things, adapted to the peculiarities of the special case. The Paris Conservatoire furnishes a model, whether for more or less exact imitation, or as an illustration of the principles on which we ought to act in England. It supplies a perfectly gratuitous education to 600 pupils, and every year presents a gift of £40 to the ten most distinguished students. Vacancies are filled up by candidates after a strict examination, including a trial of that sight-singing which the pupils of our Royal Academy never learn at all. Three times a year the students are examined, and those who show no promise are dismissed. The jury who decide on these and other questions of proficiency are eminent musicians, unconnected with the Conservatoire, which is administered by one single director. The pupils come from all parts of France, and their parents pay the whole expenses of their board, lodging, and clothing.

Whether the British taxpayer can be induced to establish any such institution in London may reasonably be doubted. That very energetic and sanguine body, the Society of Arts, is busying itself very much about it at the present time, and they have appointed a committee of about a dozen of their members to collect information and opinions bearing on the subject. If the Government are induced to listen to their pleadings, it will probably be in connection with the general education of the poor, which undeniably demands the raising of the standard of average musical tuition throughout the country. As it is, the musical teaching in Government schools is grievously deficient, nor can it be materially amended while the general teachers are the only teachers of singing. Men and women may be admirable instructors in reading, arithmetic, and grammar, and yet be destitute of the natural gifts without which it is simply impossible to teach music. If the poor are to be civilised by the influence of that divine art, it must be by instruction from well-qualified musicians. And these can only be created by some such institution as a Royal Academy, unlike in almost all respects, the present establishment in Tenterden-street, Hanover-square.

Fine Arts.

Fine Art Exhibition at the Hague.—An exhibition of works of living artists of all nations is announced to take place at the Hague next year, to open on the fourth of June, and close on the fifteenth of the following month. The exhibition is under the direction of a commission appointed by the authorities of the place, and the conditions are as follow:—Pictures are to be addressed to the *Commission Directrice de l'Exposition des Beaux-Arts, au Teeken-Academie, Princessegracht, à la Haye.* The commission will pay the carriage, provided the works are sent by slow train. All the works must be in square frames, or other frames mounted on square gilt panels. Works received from the first of May to midnight of the fifteenth. Each artist must send, under cover to the Commission, and post-paid, advice of the sending of his works, his own names in full, with address, also those of the parties who forward the case, together with a short description of the works, and a copy of the marks on the case. The sale price of the works may be given; and those who object to their pictures forming part of a lottery, which may take place, must state the fact. No artist to send more than three works. The Commission reserves the right to refuse admission, and will return rejected works as soon as possible, but at the charge of the sender. Artists proposing to send very large works are requested to communicate with the secretary of the Commission before the 25th of April. Works not belonging to the artists themselves can only be received, accompanied by a permission, with the price, if for sale, in the handwriting of the painter. The Commission reserves the prior right of sale, and will charge two per cent. on the sum received. At the close of the exhibition the works remaining unsold will be returned to the artists, at their own charge. The *Regence* of the Hague will give seven medals—three to foreign artists, and four to those of Holland. An artist may place his work out of competition if he thinks fit.

Decoration of the New Tribunal of Commerce in Paris.—The hall of the new building erected for the Tribunal of Commerce, which was opened formally not long since, and visited by the Emperor and Empress, offers an excellent example of the manner in which the public buildings of the capital of France are decorated at the present time. The hall is about sixty feet long by forty feet wide, and of proportionate height; the wainscoating, carvings, and cornice are all of oak, and the last is decorated with brackets, and having heads of lions, supporting garlands of flowers, in the metopes. In the angles of the carvings are the arms of the city of Paris, the prow of a ship supported by genii, boldly carved in oak, in alto-relievo, the effect of the wood being heightened by a few lines of ivory and gold. In the carvings are also escutcheons, bearing imita-

tions of faïence, painted in cameo on a blue ground—to be replaced eventually, it is to be hoped, by real faïence, for there can be no good reason for not employing the real thing instead of its fictitious representative. The wall panels are painted of a deep red colour, called in France *grenat* or garnet. The sides of the room are arranged, moreover, to receive four large paintings by M. Robert-Fleury, late director of the *Ecole des Beaux Arts*, and just appointed principal of the French school of painting at Rome. These works will record important events in the history of the Tribunal of Commerce. Two, which are already placed in their massive oak frames, relieved with gold mouldings, represent, one, the institution of the *Juges-consuls*, by the Chancellor L'Hospital, in 1563; the other, Colbert presenting the Ordonnance of Commerce to Louis XIV. for signature, in 1673; the two other works will have for subjects the promulgation of the commercial code by Napoleon I., and the inauguration of the present building by the Emperor and Empress. The council chamber adjoining is decorated in a similar style, with a painted ceiling, and a copy of the portrait of Louis Napoleon, by Flandrin, over the mantel-piece. The building is worthy of its important destination, and the decorations are not only good in themselves but entirely in keeping with the building and its objects.

Commerce.

COTTON IN THESSALY.—Mr. Suter's Commercial Report on the Trade of Thessaly states that cotton ginning by machinery is now in operation for the first time at Vola, at Larissa, and at other principal localities in the interior. The machines in use are sawgins of the American "Eagle" Company, and of Burgess and Key's London make. Horse-power, attempted to be applied in working some of the former, does not appear to have answered, owing to some defect in arrangement. Fifteen of McCarthy's gins have been established at Armyro, and are driven by an eight-horse-power steam-engine, set up by an English engineer, who was sent out here for the purpose last summer by the Turkish Ambassador in London. The condition of the cotton they turn out gives great satisfaction, but the quantities cleared within a given time fall far short of what they should be, which the managers ascribe to the material brought to them being insufficiently dried. Two or three of Peel's hydraulic presses established at Vola daily pack 25 to 30 bales each, but soon will be inadequate to meet the calls upon them, now constantly on the increase. The bales are from 80 to 90 okes (equal to 220 to 248 lbs. weight).

OYSTER CULTURE IN THE ISLE OF WIGHT.—It appears that a Mr. W. L. Kulbach, an officer in the army, has leased Brading harbour for the purpose of constructing ponds for breeding oysters, and commenced his works last September twelvemonth, which have progressed very favourably until to the present time. Near the mill in the harbour are four large breeding ponds, one of which is about 70 feet long by 56 feet wide; the other three are nearly of the same dimensions. These ponds are well embanked, supported by piles, gravelled, and perfectly firm and sound; are well adapted for the purpose, having hard, clean bottoms, mud being very pernicious and injurious to the growth of the "spat;" they are thatched over with fascines, and secured with galvanised wire; they have been constructed upon the best principle, and supplied with everything necessary to give success to the undertaking; they are from eighteen inches to two feet in depth. They remain full at the lowest tides, consequently the oysters are always submerged, and at high water the sites of the ponds can only be discovered by the ash poles which surround them. Already a great number of oysters are fattening for the market.

BRAZILIAN COMMERCE.—Mr. Eliot, in his Report on the Commerce of Brazil, says:—"The staple product of the Brazilian empire is coffee, which yields more than half the total amount of the exports. Valuable as this production is, and regrettable as it would be were there any diminution of it, there can be little doubt of its being undesirable for a country to depend so much on one article, of which it may be deprived at any moment. In addition to the incalculable advantages which would accrue to other countries from a more extensive system of agriculture as applied to cotton, sugar, maize, &c., the examples of Ireland and Madeira show the short-sightedness of trusting to one crop. A disease, of a similar nature probably to the oidium, has long been spoken of, and though it does not appear to have yet done much harm, one cannot think without alarm of the misery it would produce if it made any considerable ravages. How much distress might have been spared in Lancashire had Brazil been able to send supplies of cotton to replace that destroyed in the Confederate States."

APPLICATION OF SHELLAC AND THE ANILINE DYES TO PAINTING.—The *Scientific Review* says it is found that all resins having acid properties—caoutchouc and the aniline dyestuffs—dissolve in the solution of aniline. Shellac is thoroughly soluble in it, and the resulting solution may be coloured with the concentrated solution of an aniline dyestuff, the result being an excellent material for producing transparent paintings on glass, porcelain, &c., to which it very firmly adheres. The aniline dyestuff may be dissolved directly in the aniline solution of shellac, with the aid of heat; but not fuchsine, since this, when heated with shellac, is changed to blue, hence, when this substance is to be dissolved, a solution of it in aniline, prepared without heat, is to be mixed with the aniline solution of shellac. These shellac solutions of the dyes may be mixed with oil paint not containing lead, and thus a brilliancy of tone may be imparted to the various colours in oil which they do not themselves possess.

Colonies.

COTTON IN QUEENSLAND.—A colonial journal says:—"This colony can grow the New Orleans and Egyptian varieties of cotton and the delicate Sea Island as well. Of the chief varieties all but the Sea Island can be grown at a profit in many districts, especially in what is now called Riverina, and shipped within a few hours at Melbourne by the Echuca Railway. Asiatic labour, however, is the *sine qua non*, as has been proved by experience for many years past in the Mauritius, and during the last five in Natal. Australia can get it as easily as Mauritius if she wish it, only she does not wish it, as the working class regard the Chinese and Coolies with jealousy, as likely to lower the value of labour, forgetting that new industries and the development of neglected resources augment not only the common wealth but extend the demand for and the value of individual labour. There is little doubt, however, that ultimately self-interest will prevail; each year will make the growth of cotton and sugar a greater necessity in those districts where the three essentials are combined—soil, water, and a temperature quite as suitable for the immediate purpose in view, and in all other essentials superior to those of Louisiana and the Carolinas."

EMIGRATION.—The return made by the Government emigration agent at Liverpool, for the year 1865, is as follows:—Under the Emigration Act 66 ships sailed to Canada and Australia; for Canada—33 ships, 1,114 cabin and 7,570 steerage passengers, of whom 3,289 were English, 1,671 Irish, and 2,115 other countries. To New South Wales—two ships, two cabin and 1,281 steerage passengers. To Queensland—six ships, 49 cabin and 2,139 steerage passengers. To Victoria—25 ships, 316 cabin

and 6,343 steerage passengers.—Total sailing under the Act, 363 ships, to Australia and foreign parts, conveying 6,460 cabin passengers and 107,147 steerage passengers, of whom 31,819 were English, 3,011 Scotch, 49,401 Irish, and 22,576 other countries.

Geology of Australia.—In a short notice of the geology of Australia, given by Mr. Gregory, the results of the observations have been more extensive than any other Australian explorer. With an intimate knowledge of the rocks of both the east and west sides of the continent, Mr. Gregory has had more opportunities of examining those of North Australia. He does not think that coal will be found north of lat. 23 deg., and he regards the quartz rocks as showing no indications of gold, because they do not occur in veins, as in Southern Australia. The west side of the 143rd meridian is composed of a table-land of sandstone, lying upon beds of shale, schist, and silicious limestone—the latter with fossils. East of the same meridian is a district, the geology of which shows more metamorphic action than anything else. There are slates, granites, porphyries, and soap rocks, with interstratified beds of quartz, doubtless also due to metamorphic action. The beds are much disturbed and contorted, the most recent elevation being due to injections of volcanic rocks, which have been pushed through fissures, and not through the modern outlet of volcanoes. Generalising from these facts, Mr. Gregory conjectures that the whole of tropical Australia has been elevated since the deposition of the red sandstone, and has not since been submerged.

Publications Issued.

De la Propriete des Mines. By Edouard Dalloz and A. Gouiffès. Paris. 2 vols., 8vo.—Another example of a class of valuable books now produced largely in France, containing a mass of information on the jurisprudence and statistics of great industries. The authors of the book in question are both lawyers, M. Dalloz being also deputy and president of the *Conseil-Général* of the rich geological district of the Jura, and M. Gouiffès one of the judges of the tribunal of Morlaix. The work treats fully of the jurisprudence respecting mining property in France and Belgium, and an inquiry into the mineral resources and legislation of other countries, and is described by its authors as a theoretical and practical guide for the use of the legist, engineer, and miner.

Notes.

Musical Education in Paris.—The municipal authorities of Paris are using great efforts to make singing an integral portion of the education of the people, as it is in many parts of Germany. The establishment of singing classes, both for children and adults, in all the commercial schools of the capital has been before mentioned, and an attempt has now been made to give character and tone to what is taught there. A competition is opened for choral compositions to be executed by the pupils of the primary schools, and the classes of adults in the city. The pieces are to be written for three or four voices, without accompaniment, and a jury named by the Prefect will award the prizes. The choice of the words is also left to the composers, but they must, of course, be in accordance with the object in view. The number of pieces to be unlimited, and a prize of 300 or 500 francs, according to merit, will be awarded to each composition accepted, the copyright of the successful pieces to be the property of the municipal authorities. There is no doubt that the appeal will produce a perfect flood of compositions, although the prizes are not large, the amount of musical talent unemployed being enormous. Choral harmonies of this kind have not been much cultivated in France, and this proposition of the Prefecture may have the effect of turning the attention of some young composers to music of a sounder, though less pretentious character than that generally in vogue.

Copper an Antidote to Cholera.—Mention was made in the *Journal* some weeks since, of the fact of more than one eminent French physician having used salts of copper internally, and even copper itself applied externally, in cases of cholera, with great success. It was then stated that workers in copper were known to be free from the disease, even when in the midst of sufferers from it; this has since been confirmed by the metal turners employed in a large Parisian factory. A pamphlet has just appeared, with the title of *Métallo-thérapie*, by M. Burg, which sets forth the evidences of the preservative effects of copper in a remarkable manner. In support of the theory it is now affirmed that the great district of copper pyrites of the Rio-tinto, and its prolongation on the Huelva, in Spain, has never been visited by cholera, which has upon several occasions desolated the peninsula. Were the copper districts of Cornwall exempt from the epidemic when it raged in England?

The Silent Coal Scuttle.—Mr. John Murray, of Whitehall-place, suggests, for the annoyance caused to invalids by the act of putting coals on the fire, a very simple remedy. It consists in wrapping the coals in paper bags, and placing them quietly on the fire with the hand, when the bags quickly ignite, and leave the coals to be distributed noiselessly over the fire. Bags of the required size, holding from three to five pounds of coal, may be purchased for a mere trifle. The inventor says he has for many years tried this plan with complete success, in the houses of himself and friends.

Abolition of Bridge Toll in Paris.—The bridge of Grenelle, which was included in Paris by the last extension of the limits of the city, was the only one at which toll was taken, and this was abolished and the bridge thrown open to the public on the first day of the present year. The bridge was built by a company, which was to receive the bridge tolls and the fees paid for mooring boats and barges alongside a wharf connected with it, for the term of forty-seven years, that is, till 1874, so that the period of opening it has been forestalled, by special arrangement, for eight years. The nearest toll bridge to Paris is now that of Surenne, on the further side of the Bois de Boulogne.

Domestic Stocking Frame.—A small knitting frame, contributed by a mechanician named Bakenheim, to the Cologne Exhibition, is highly spoken of. With eighty-four needles, the machine is said not to weigh more than fourteen or fifteen pounds, and to be adaptable to any work-table. It is said to produce from ten thousand to thirty-five thousand points or meshes per hour, and to be worked with great facility. Whether it is a mere modification of the old stocking-frame, or of the circular knitting-machine, or an entirely new arrangement, is not stated.

Ants' Eggs.—It appears that last October a poor woman was taken up by one of the foresters at Fontainebleau for having carried away quantities of ants' eggs from a formicary. Ants abound in the Fontainebleau forest, and instead of wishing to get rid of them, the administration of the woods and forest preserve them carefully on account of their value as food for all species of game, but more especially for young partridges, as well as their utility as manure. Many varieties of seeds, &c., have been tried as a substitute, but nothing has proved so nutritious to the 5,000 or 6,000 pheasants preserved in the imperial shooting grounds as the ant. A proof of the value of ants' eggs is the frequent attempts made by all the poor residing in the neighbourhood to carry off supplies of this strange edible, in order to sell them to the proprietors of private pheasantries. The forest laws, therefore, have constituted into a fraud the act of rifling an ant-hill of its store of eggs, and the poor woman cited before the tribunal as guilty of this act was fined a small sum.

Fire Telegraphs.—The authorities of Rouen have established a series of telegraphic wires in connection with the corps of firemen. The town is divided into fifteen quarters, in each of which is a *pompiers'* station with a telegraphic apparatus, and all the stations communicate with a central one, which includes the firemen's barracks, and from this chief post the signal is repeated to all the other stations, and also to the ringer of the alarm bell, which announces the fact of a fire having broken out to the whole population of the place.

Correspondence.

Registration of Trade Marks.—Sir,—As I was one of the first persons who ventured to advocate publicly a system of registering trade marks, and as I have long taken great interest in the subject, I have naturally observed with pleasure, that an association for carrying a project of registration into effect has started into existence at Birmingham. Although I am not certain that the machinery of an association was necessary to press the expediency of such a measure upon Government, yet I believe it to be a matter of satisfaction, that manufacturers have taken at least one step towards converting the existing Trade Mark Law into a substantially useful enactment. How manufacturers, if really alive to the importance and necessity of a protective act of this description, could have permitted the passage of the Act of 1863 without provisions for registration, is simply mysterious. But, although the association is established for the promotion of a bill for registering trade marks, its managers should be careful to be advised by practical men before submitting to Government any project of bill or recommendation of legislation, or otherwise the object of the association will be defeated. For example: there is at present a system of registration of (ornamental) designs; but there is no system of public inspection (except by judge's order) to enable persons to ascertain whether a design be registered, and, if so, what is actually registered. True, that persons on producing a copy of a registration work, can discover whether such a mark had ever issued from the Designs' Office; but such a restricted amount of knowledge is of very little use to persons desirous to find out whether a particular design be really registered, or whether a design, marked as registered, be the same intrinsically as the design actually registered under that mark. The difficulties in the way of obtaining a judge's order are, as I know by experience, by no means specially inviting. A system of registration of trade marks, without facilities of public inspection, would be practically inoperative. If the Trade Mark Act is to be amended (a consummation devoutly to be wished), let a satisfactory amendment be adopted. If a plan of registration is to be introduced, it must be supported by suitable collateral provisions. A certain discretion should be left to the Registrar to decide whether a mark presented for registration be a substantive trade mark; if not, a single letter, a single number, a simple word, a scarcely distinctive or distinguishable mark, which certainly would come within the definition, or want of definition, of the present Act, would be matter for registration, and therefore remain as a trade mark liable to be very innocently infringed. Full facilities for inspection of registered trade marks should be provided, on payment of small fees, the time for search not to be restricted narrowly, as under the Useful Designs Acts regulations. A fee for registration should be charged, so that a sufficient number of intelligent officials may be employed to ensure due attention to the exigencies of the system, and some modifications in the severity of the present penal provisions of the Act should be introduced; since under actual arrangements, the Act is, as cases show, inoperative as regards fraudulent imitators, as these may anticipate immunity from the kindly dispositions of persons unwilling to pursue offenders with the Draconic severity which grimly pervades the penal clauses of the present Act.—I am, &c., M. Henry.

68, Fleet-street.

The Architectural Press and Captain Fowke.—Sir,—I am not sure that I take an altogether dignified course in replying to your anonymous correspondent of last week, who, under the note headed as above, proceeds to say:—"One or two persons having raised doubts as to the confirmation by the press," &c.; who, to meet a contradiction that had reference only to the allegation of a confirmation of the judges' award by "the *architectural* press," puts forward the *Telegraph*; and who quotes from a single one of the three articles to which I directed attention, and from the notice of one design passages that seemed to him favourable; but who has *misquoted* part of a sentence so as to alter its sense. Yet, as some persons may not recollect what was Mr. Cole's statement, or may not have seen my letter in your number of December 22nd, or read the three articles, it may be well to expose the stratagems to which injudicious friends of the highly-talented and greatly lamented officer resort. Your correspondent first attempts to divert the issue from the original point as to the press architectural, to one of the press general, and then to adduce the words of the latter press as evidence which might be taken in support of the allegation as to the press architectural. I don't think that many, even in this age of hasty reading, will be misled by the artifice. As to the quotation from the *Building News*, which places the decorative character of Captain Fowke's design as best, compared with the character of designs of a designated class, and mentions symmetry of plan, but says absolutely nothing of the fitness of the design with reference to purposes of a museum—and which prophecies an award as the result not of excellence in planning, but of "very taking" character of one *drawing*—and that one the least important of the set of drawings—your correspondent's simplicity is wonderful: though, ignorance of the fact that good *design* does not necessarily accompany good *drawing* is not unusual. The quotation from the *Builder* contains a very decided expression of opinion of the drawings, but none of the merit of Capt. Fowke's design as regarding the immediate purpose of the Natural History and Patents Museums. Even the praise of the decorative effect of the group of the buildings to cover the entire ground occupied by the building of 1862, is qualified by the words "as in the drawing;" and, in the article itself, it was remarked tha tthe "external effect even would not equal what might be supposed only from the view." It was convenient to your correspondent to omit many other passages, the reverse of confirmative, in the three articles to which I directed attention. Such praise as was given, beyond that mentioned, was given to the manner in which the competitor had "addressed himself" to one portion of the set of problems comprised by the instructions. One of the main problems was the provision of a Natural History Museum and a Museum of Patents, to occupy together the eastern portion of the ground bounded by Exhibition-road. These buildings were to be erected first; and to them, the chief immediate attention to internal arrangements was required to be given. The other problem included the covering, at some period undetermined, of the whole ground, extending to Prince Albert's-road, with buildings. The words in the *Builder* are to the effect that the competitor had "addressed himself" to one of the problems: they do not say that he succeeded in the more pressing one, which required the minute study of questions of accommodation of particular collections, and questions of lighting. I repeat that I have nothing to say, here, of the actual merit of Capt. Fowke's design: I say only that "the architectural press," at the time referred to, did not confirm any decision; and I am prepared to show that the decision was a hasty

one, and therefore an unwise one. But your correspondent, in his quotation, has so altered a parenthesis as to make it appear to an ordinary reader, or to one not familiar with the instructions, and with the site, that the Natural History Museum and Patents Museum were to extend over the whole ground, to Prince Albert's-road; and that they constituted the particular problem to which the competitor, afterwards found to be Capt. Fowke, had "addressed himself." Of course your printer will be said to be in fault; and certainly, there is an error in the following sentence, which might give colour to the view. Therefore I will merely say, that should there be a place of punishment for literary offenders, the most uncomfortable corner of it should be reserved for those who give that sort of false evidence which embodies itself in misquotation. Your correspondent refers to three "newspapers" as the only ones "known to have criticised the plans in detail." I will make him a present of another, the *Athenæum*, one not unfriendly to South Kensington; and I say, that were I to follow his practice of quoting only what might seem favourable, I could give, from the journal named, as much that might be read as at variance with the judges' decision in this case (and quoting correctly, too) as your correspondent has been able to find in the *Builder*, of the nature of confirmation. Were not the present matter of great importance, viewing the probability of immediate proceedings connected with certain public works contemplated, there would be no necessity to trouble your readers at this length; but as the position is, there is the utmost importance in removing some of the misconception that exists as to the manner in which drawings in a collection of competing architectural designs should be looked at, and as to the time, exertion, and extra-professional as well as professional experience and other qualifications, that are needed for the performance of the judicial functions.—I am, &c., EDWARD HALL.

3, Adam-street, Adelphi, 10th January, 1866.

MEETINGS FOR THE ENSUING WEEK.

MON. ...British Architects, 8.
Society of Arts, 8. Cantor Lectures. (Lecture III.) Mr. G. W. Hastings, "On Copyright and Trade Marks"
Medical, 8. Dr. Tilbury Fox, "On Leprosy, with Notes taken during recent Travel in the East."
R. United Service Inst., 8½. Capt. W. Horton, R.N., "The Necessity for Building Unarmoured Ships of War."
Asiatic, 3.

TUES.....Civil Engineers, 8. Discussion upon Mr. Grant's Paper, "On the Strength of Cement."
Statistical, 8. Mr. T. A. Welton, "On French Population Statistics."
Pathological, 8.
Anthropological, 8.

WED....Society of Arts, 8. Mr. Alexander Bain, "On Automatic Telegraphy."
Meteorological, 7.
London Inst., 7.

THURS...Zoological, 4.
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8.
Chemical, 8. 1. Dr. Gladstone, "Pyrophosphotriamic acid." 2. Prof. Wanklyn, "Reactions of Sodium-ethyl."
Numismatic, 7.
Royal Society Club, 6.

FRI.......Royal Inst., 8. Prof. Tyndall, "On Radiation and Absorption, with reference to the Colour of Bodies and their State of Aggregation."
R. United Service Inst., 3. Lecture by Mr. Oliver Byrne, "The New Science of Dual Arithmetic applied to Naval and Military Calculations."

SAT .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Westmacott, "On the Way to Observe in Fine Arts."

Patents.

From Commissioners of Patents Journal, January 5th.

GRANTS OF PROVISIONAL PROTECTION.

Bituminous shade, obtaining oil from—3296—J. Watson and J. Player.
Blast furnaces, collecting gases arising from—3261—S., S., J., and W. Whitehouse.
Boots and shoes, waterproof—3270—J. Bolton.
Bridges and viaducts—3246—C. de Bergue.
Clasp or dress preserver—3298—H. E. Newton.
Coal, &c., compressing—3242—H. G. Fairburn.
Cocks or valves—3333—C. W. Moore.
Door locks and latches, furniture of—3290—J. Martin.
Dyeing and printing—3280—L. Durand.
Electro-magnetic engines—3282—A. V. Newton.
Electro-telegraphic wire conductors—3289—W. Boggett.
Envelopes—3301—V. P. P. V. Leuf.
Envelopes—3331—F. Jenner.
Felt—3228—H. Prowse.
Fibrous plants, &c., producing fibre from—3112—J. Steart.
Fibrous substances, holders in hackling machines for—3250—C. Blyth.
Fibrous substances, preparing, &c.—3212—J. Campbell, S. McKinstry, and T. Wilson.
Files, cutting—3165—G. T. Bousfield.
Fire-arms, breech-loading, and cartridges for same—3337—C. Reeves.
Fire-places and furnaces—3247—G. Warriner.
Fire-places, furnaces, and stoves—3327—J. Jeffreys.
Floor cloth—3252—F. Walton.
Fruit, &c., dressing—3133 E. Whele.
Glue or gelatine made insoluble in water—3326—W. E. Newton.
Grain, drying and bleaching—3276—W. Creasy.
Heating, &c., burning combustible vapour for—3317—G. Davies.
Levels and theodolites—3329—J. C. Haddan.
Locks and latches—3274—J. T. Dawes and J. Robbins.
Metal goods, lacquering and finishing 3264—J. Harcourt.
Metal nuts and dies for same—3266—O. C. Burdict.
Motive power, obtaining—3260—C. L. W. Reade.
Needles, cases for—3309—R. Newhall.
Optical arrangement producing a new scenic effect—3286—W. Ken.
Pipes, &c., discharging the contents of—2926—S. Middleton.
Pumps—3315—W. Jackson.
Railway passengers, safety of—3068—R. Howarth.
Railway trains, arranging railway carriages so as to diminish the consequences of accidents to—3244—H. Negretti and J. W. Zambra.
Reaping and mowing machines—3142—A. C. Bamlett.
Sewing machines, applying wax to thread used in—3240—W. R. Lake.
Shears and scissors—3254—R. Badger.
Shells, igniting—3275—C. A. McEvoy.
Ships and vessels, propellers for—3295—F. L. and C. L. Hancock.
Ships' bottoms, cleansing—3220—H. F. McKillop.
Ships, cleansing and repairing the bottoms of—3313—J. Anderson.
Spinning and doubling, machinery for—3234—J. Rice and R. Cotton.
Spinning, caps used in—3323—E. Clifton.
Steel—3288—J. Birch.
Steering indicators and tell tales—3341—C. J. Vlieboff and J. A. Matthiessen.
Torpedo mines electricity for testing of—3154—N. J. Holmes.
Type, machinery for "composing" and "distributing"—3164—A. Mackie.
Vessels built of iron, &c., applying copper to the bottoms and sides of—3339—W. F. Deane.
Woollen yarns and cloths, cleansing—3221—B. Porritt & W. Priestley.
Weaving, regulating threads in—3236—R. A. Brooman.
Weaving, looms for—3307—W. E. Laycock.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Distilling—3351—N. W. Wheeler.
Duplex steam engines—3350—N. W. Wheeler.
Vessels—3352—N. W. Wheeler.

From Commissioners of Patents Journal, January 9th.

PATENTS SEALED.

1825. J. Jones.	1848. J. B. Chatterley.
1826. R. Hineson.	1852. W. P. Bayliss.
1827. H. Fearnley and C. Smith.	1864. R. A. Brooman.
1829. J. Soutter, sen., and T. Christie.	1866. J. P. B. Le Patourel.
1830. F. Massey.	1880. J. G. Rowe.
1835. B. Fothergill.	1906. E. Schaub.
1836. M. H. Keene.	2038. J. H. Johnson.
1839. S. B. Howlett.	2190. A. V. Newton.
1840. A. Denayrouze.	2729. L. D. Girard.
1841. H. Blair.	2943. H. Cochrane.
	2964. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

4. M. E. Bowra and A. E. Francis.	61. T. Aveling.
37. H. Bessemer.	68. A. Guild.
114. H. Bessemer.	79. E. T. Hughes.
	97. W. Clark.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

52. I. Holden and A. Holden.	50. J. H. Johnson.
69. J. T. Forster.	74. T. J. Claxton.

Registered Designs.

A Brush Body—December 21—4759—J. H. Cheatle, Broadway-street, Birmingham.
Euthenima Bodice—December 21—4760—W. C. Jay, 247, Regent-street.
Sorptor or Digit Blotter—January 9—4761—R. T. Jupe, 64, Wardour-street.

Journal of the Society of Arts.

FRIDAY, JANUARY 19, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

JANUARY 24.—"On the Uses of National Museums to Local Institutions." By Lord HENRY G. LENNOX, M.P. On this evening A. H. LAYARD, Esq., M.P., will preside.

JANUARY 31.—"Dwellings for the People; how to Multiply and how to Improve them." By THOMAS BEGGS, Esq.

INSTITUTIONS.

The following Institutions have been received into Union since the last announcement:—

Freetown (Glossop) Working Men's Institute.
Lambeth Evening Classes, Hercules-buildings, Lambeth, S.
Plymouth Wesleyan Institution.
Wallingford Mechanics' Institution.

CANTOR LECTURES.

The concluding Lecture of the Course, by G. W. HASTINGS, Esq., LL.D., will be delivered as follows:—

LECTURE IV.—MONDAY, JANUARY 22ND.—"On Limited Liability."

The Course of Lectures "On Submarine Telegraphy," by Fleeming Jenkin, Esq., F.R.S., will commence on Monday, January 29th.

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing ONE Friend to each Lecture.

Tickets for Mr. Fleeming Jenkin's Course, for friends of Members, will be issued with next week's *Journal.*

PARIS UNIVERSAL EXHIBITION OF 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for without delay.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The Committee met on Wednesday, December 20th. Present:—Henry Cole, Esq., C.B., in the chair; Lord Gerald Fitzgerald; Sir John Harington, Bart.; Colonel Scott, R.E.; and Edgar A. Bowring, Esq., C.B.

Mr. HENRY F. CHORLEY was further examined by the committee:—

498. You have expressed a wish to make a few additions to the evidence you have already given before this committee?—I did so: but, on reconsidering the matter, find that I have one or two things only to add. On looking over the testimony offered by me on 12th June, though it was said at a moment's warning, and under natural restraint—the constitution of your committee considered—having looked over my evidence rather carefully, and having revised it for publication in the Society's *Journal*, I do not find one word I have to unsay, or one instance unjustly adduced, or one opinion that has not been strengthened by the experience which subsequent inquiries have brought to me. Let me add (as the only witness as yet examined who has been at no period connected directly or indirectly with the Academy) that I have taken some pains in the interim to ascertain what objections, if any, could be made against the facts I brought forward, and the opinions I delivered, on the part of those who think more favourably of the institution than myself.—Not one assertion in disproof has reached me; and hence, I repeat, my present testimony will, of necessity, be less both in quantity and importance (whatever that may have been) than my former one.—Meanwhile I consider that much which Mr. Macfarren has stated goes to confirm my conviction that the whole establishment is in such a thoroughly rotten state that there is no possible patching of it up.

499. Will you favour the committee with your opinion as to the station in the musical world which the principal of the Royal Academy of Music in this country should hold?—He should be some such man as Cherubini. Get the very best man that you can—no matter of what country.

500. And pay him well?—Pay him so well as to make it worth his while to make it his principal business. The reconstruction of a musical school, such as ought to have government support, will be no light task, neither will its superintendance.

501. Have you any notion of what you would consider a liberal payment?—That must, I suppose, in part depend upon the sum you get from Parliament.

502. What kind of grant should you like to see?—I have already stated that—and I find that the same sum has suggested itself to other bystanders besides myself.

503. You desire to have an annual grant from Parliament of £10,000. With such a grant as that what would you consider a proper salary to be paid to the principal of the Academy, of such standing as you indicate?—Assuming the income from the public funds at £10,000 a year, a fair remuneration to the principal would be, I should think, £1,500 a year.

504. Giving the whole of his time to the duties?—The larger part; you could not have a young or an inexperienced man.

505. Do you think it necessary that the whole of his time should be given to the duties?—Not necessarily; it is possible, while the students are in bed or away from the Academy, the Principal may, if he pleases and is able, compose. Both Cherubini and M. Auber have done so; but it should be his primary ambition to make the school successful, and he should not be interfered with save on very grave grounds.

506. You would have a claim upon the whole of his time?—Every man must have a portion of leisure, as I have explained and instanced already.

507. You consider he should keep himself up to the current mark, and not get in arrears in his own speciality?—I cannot give a stronger instance than Cherubini, who raised the Conservatoire of Paris to the highest point to which any musical school was ever raised.

508. If Parliament were disposed to make a liberal grant, you would not object to the Academy making annually a full report to Parliament of its proceedings?—Quite the reverse: the fullest information should be laid

before the country at stated periods; but I would have the administration of its affairs, as I have already said, and will repeat, in as few hands as possible, and made as despotic as possible, and as little interfered with as possible by the perpetual suggestions of *dilettanti* patrons.

509. You would think it necessary, however, in addition to the Parliamentary grant, if there should be contributions from the public in any shape, that the public should be represented in the management of the Academy?—Yes; with regard to certain scholarships. If a person choses to bequeath £100 as a legacy to establish a scholarship, why should he not do so?

510. That is hardly the point. If funds are derived from the public, do you not consider that the subscribers should have the privilege of electing one or more persons to represent their interests?—I doubt it very much—any more than I would have every one founding a scholarship permitted to nominate his own scholar. It might lead to perpetual bickering, partisanship, and jobbing. If the admission to the Academy and its privileges was made sufficiently stringent, if its discipline was wisely considered, and its concerns uprightly administered, I conceive that sufficient check would be provided to prevent any abuses, which would not, at once, present themselves in the report. Let me turn to another point. I do not wish to oppose the views of Mr. Macfarren, but I have very great misgivings regarding anything in the shape of concerts by the students, because everybody goes to them disposed to admire and to praise; the fathers and mothers of the pupils, and the people who have paid for their education. You can hardly get a good general judgment of the performances under such circumstances.

511. Do you not think concerts by former pupils might be established?—I don't see what earthly good they would produce. I think when a student has finished his education, he will go somewhere else, and you cannot rely upon the old students for the concerts.

512. Do you not think old students residing in London would attend the concerts once or twice in a year for the benefit of the Academy?—I doubt any measure of the kind. I don't see that you would get any good by it. It would always be like a bad charity concert.

513. Are not the concerts given by the Conservatoire of Paris performances of the former pupils?—The whole system is so different. If you give me the Conservatoire of Paris I will give you the concerts. Further, at the Conservatoire of Paris the performances are helped by the best possible talent out of the Academy that is attainable; otherwise they would be as lame in orchestral execution and in solo singing as I have frequently heard them in the choruses the students prepare. Nor is any student's music admitted save under the severest restrictions. They are a series of conservative entertainments, singularly barren of enterprise and variety of selection, which, however perfect in some points, owing to the narrowness of their range, which admits of the polishing process being carried to its utmost, I cannot think have any great bearing upon, or reflection of, the state of the French school for music and drama.

514. You would not have concerts of the Academy unless they could be of such a character as to attract large audiences?—The band of the Conservatoire of Paris is not composed of students alone, but they engage the best *artistes* that can be procured.

515. In addition to the orchestra of the Conservatoire?—Yes.

516. Do not all the pupils take part in the concerts?—They may, if they are wanted; but the band is made up of the greatest musicians they have.

517. But do not all the pupils play in the band?—I should be sorry if they did.

518. Do you happen to know if the pupils of the Conservatoire are allowed or obliged to take part in the concerts of that institution?—Surely; and then there is this thing that ought to be said about the Conservatoire of Paris—any pupil who obtains a first prize in singing, has a right to make his or her first appearance at one of the government theatres, and pupils distinguished for declamation have I believe a like privilege for appearing at the Théâtre Français.

519. Do you think that system worthy of imitation in this free country?—Yes, decidedly; so far as it can be carried out, but the matter would adjust itself. Any competent musician is sure of remunerative occupation in this country, and this with less waiting (and, I am glad to add, less intriguing for the suffrages of the press, or the aid of any indirect influence or unfair patronage) than, I fear, is the case in France, Germany, or Italy.

Mr. B. St. John B. Joule (of Manchester), examined by the committee:—

520. Do you think the Royal Academy of Music in its present state has the confidence of the country at large?—As far as I know the feeling, it has not that confidence.

521. Important evidence has been given before the committee, showing that there is a disposition on the part of the authorities to make it conform itself to the times, and to enter upon a course of improvement. Supposing it were all you conceive a central institution should be, do you think, in its reformed state, it would have the confidence of the country?—Yes; I think among local professors and the musical public connected with country towns, the feeling is that it is out of the question to try to establish any local institution which could offer the advantages that could be afforded by an Academy in the metropolis—particularly on account of the variety of talent required in such an institution. Although we have Mr. Hallé at Manchester now, and though he employs many excellent orchestral players, yet his residence in Manchester may be only temporary. I think Manchester would be well satisfied with an efficient central institution somewhere.

522. And would directly or indirectly support it?—Yes.

523. Do you think such central institution should be in the metropolis?—I think that is the general feeling.

524. Do you think one such institution would suffice for the whole kingdom?—Yes; I think so.

525. As you take great interest in music, perhaps I may ask what may be your personal connection with it?—I was for seven years honorary organist and choir master at Holy Trinity Church, Manchester, and I have subsequently held the same position for upwards of twelve years at St. Peter's Church, where the best available talent is engaged, and full choral service is performed.

526. You have considerable knowledge of the musical feeling of that locality?—I am personally acquainted with most of the professors and amateurs of music, and I have for many years attended every principal concert in Manchester, and have written the critical notices of them which have appeared in the *Manchester Courier*.

527. You think it likely Manchester would be glad to send up young persons having musical ability to be educated at a central national institution?—I think it is likely, and I have heard an opinion to that effect expressed more than once.

528. Do you think the parliamentary representatives of Manchester would give their support to a liberal grant for the purpose of placing the musical education of this country on as good a footing as in other countries of Europe?—Perhaps they would; I should hope so. One principal deficiency in the Academy, as it now exists, is the absence of scholarships worth competing for, a want which a liberal grant would meet.

529. Are you aware that the State at the present time gives to students of art throughout the kingdom training as teachers an allowance of £1 per week for maintenance and gratuitous education, besides which their teaching costs from £40 to £50 a year each?—Yes.

530. You think an analogous proceeding might be taken with regard to music?—I decidedly think it would be a fair and proper thing.

531. You think the country at large would gain advantage by it?—I think so.

532. What is your opinion with regard to Mr. Macfarren's proposal to attach a chapel to the Royal Academy for the performance of choral services by the students?—I quite agree with all his views on that subject, and he has left me very little to add upon it, except to suggest that the institution should be careful not to lose control over the chapel by permitting it to be consecrated. I think a licensed chapel would be a great advantage, not only as giving the pupils opportunities of hearing our own church music of the highest class, but as preparing them as singers and organists for the duties which in very many cases, in fact in nearly all country towns, professors of music undertake in order to supplement their incomes. We generally find a professor of music in a country town looks forward to the position of organist as a means of introduction as well of direct income.

533. You do not sympathize with the difficulties which some people might apprehend in a religious or conscientious point of view?—I do not see any great difficulty in the matter. I think a professor coming from the Academy, after training in that particular class of music, would be received by the clergy with greater favour and confidence.

534. Do you consider a great improvement has of late years taken place in church music?—As far as the north of England is concerned I consider an immense improvement has taken place and is still progressing.

535. That is not to be received as an argument against going on farther.—I think it is a reason for going farther.

536. Do you think it desirable or advisable to institute collateral educational establishments in the large towns of England connected with the Royal Academy in London, or do you think pupils from different parts of the country should be sent to London to be educated?—I think they should be sent to London. I think it very likely the local teaching would be found not to agree with the practice of the professors in the academy, and that would be productive of disadvantages, not the least of which would be the consequent loss of time.

537. You would require that a student sent up from any locality should be certified as having musical aptitude?—Certified by a local board or professional testimonial; but I would not allow such certificate or testimonial to supersede an examination in London, because, in the case of local boards and private testimonials, an unbiassed judgment may not always be given, local and personal influence being sometimes very great.

538. There is a practice in the Science and Art Department as follows:—A student may present himself for examination at the central examinations conducted by the Science and Art Department, and if he passes that examination his expenses are paid by the department. If he does not pass he has to bear the expense himself. What do you think of such a plan?—I think that is a very fair arrangement, and I think a similar one would be equally so in the department of music.

539. Assuming the institution to be in the metropolis, you have no desire for any particular situation?—No.

540. You would not like Smithfield on account of its being most centrally situated?—I think the name would be sufficient, besides I doubt whether Smithfield can be considered the *musical* centre of the metropolis.

541. Do you attach importance to having a musical library?—I think it a necessary appendage of such an institution. It occurs to me to add to what has been stated by Mr. Macfarren on that subject—that though it might not be desirable to remove the contents of the British Museum to another locality, yet there are many works which are useful for reference—particularly in the study of harmony and composition—which, on account of their expense, most persons would scarcely like, and many might not be able, to purchase. Thanks to the enterprise of our publishers, many excellent works on the theory, &c., of music have been brought within the reach of ordinary students, but the full scores (the study of which is so important) of the vocal and instrumental compositions of the great masters, Bach, Handel, Gluck, Haydn, Mozart, Cherubini, &c., are still expensive, and will most probably continue to be so. These I consider it highly desirable that the Academy should have.

542. In the art training school there is an art library, and two copies of the more important works are obtained, one of which is circulated among the classes throughout the country when they desire it; do you think anything of the same kind would be useful in regard to music?—The circumstances are different. You are not proposing, as I understand, to have local musical institutions.

543. Are there not local philharmonic societies?—Not in Manchester.

544. They have in Liverpool?—Nothing which approximates to a musical school at all. The principal artists, I believe, as in Manchester, are engaged for the night; the members of the band for the season, but the latter are called upon for no further practice than the rehearsal which precedes any ordinary concert.

545. With respect to the fees at present paid by the students of the Academy—viz., thirty-three guineas per annum or eleven guineas per term, do you think it advisable to lower the scale of fees paid by the students, or do you think it would be unadvisable to admit them at too low a scale of fees?—I think increasing the scholarships would be preferable to lowering the scale of fees.

546. You think a good education is worth paying for?—Anything good is worth paying for. I think the difficulty might be met by increasing the number of scholarships, which would be most likely to benefit the persons receiving it. All the persons who go to the Academy to study ought, I think, to pay for it.

547. You would see no objection to a graduated system of this kind—that high musical ability should, if necessary for its development, be educated at the expense of the state; and that somewhat less ability should be educated at a low fee; and that so far as the accommodation of the premises permitted, the public should be educated at fees that may be remunerative to the institution?—I think that would be a very fair way of putting it. I think the general public should pay for this as in everything else. I think it would be a misappropriation of the funds to give education to persons who do not wish, or are not likely, to make a return for it. I think the ability or not to pay for the education has nothing to do with the matter. I think the question of payment should rest upon the musical ability of the pupil.

548. Do you think that this Academy should be devoted to a large number of pupils of moderate talent, or to a select number of great talent?—On that point I think a great deal depends upon the grant obtained from Parliament.

549. You think it would be more creditable to the country itself to educate its own pupils than that they should be attracted to foreign academies for that purpose?—Very much so; and I think it would not only advance the English School of Music but that it would be to the benefit of the pupils themselves in many respects that they should receive their education in England.

550. You think there would be no difficulty in finding enough pupils to educate if a thoroughly good Institution were established for that purpose?—I think not.

The Committee then adjourned.

CANTOR LECTURES.

THIRD LECTURE.—MONDAY, JANUARY 15.

ON COPYRIGHT AND TRADE MARKS. BY G. W. HASTINGS, ESQ., LL.D.

Mr. Hastings, in commencing his third lecture, said that, in dealing with the subjects selected for the two latter lectures of his course, it was not his intention to enter into legal technicalities so much as to bring under the notice of the audience certain leading principles, and to

discuss the policy of legislation. It was in this manner that the topics of "Copyright" and "Limited Liability" would be treated. Copyright is generally classed with patent right, and in legal treatises they are often discussed together. In a sense this is correct, both being incorporeal rights, and having certain points of resemblance; but in some respects they differ essentially. The policy of maintaining a patent system has been much debated of late years, and nowhere more eagerly than in this Society. That is a question not to be entered on in this lecture, but it may be well to point out that there are arguments in favour of the maintenance of copyright which would remain intact, even if the reasons advanced for the abolition of patents were adopted by the Legislature. Copyright, for instance, is in the specific thing produced, as a book; patent, of a process, or of the use of the thing invented. Copyright, therefore, does not, like patent, operate as a monopoly. When Sir Walter Scott wrote the novel of "Waverley," he invented, so to speak, the historical romance in this country. Now, if the Legislature had granted to him the sole and exclusive right for a term of years of producing historical novels, that would have been analogous to a patent; what he had was the privilege of printing and publishing the specific work of "Waverley," to the exclusion of others. No one was forbidden to compose historical novels; no one was forbidden to imitate "Waverley." It might be imitated closely, in the scenes described, the period chosen, the characters delineated; nay, if the mental process by which Scott worked could have been discovered, that might have been appropriated; it was only the book itself, the *ipsissima verba*, which could not be pirated. And observe the results which flow from this distinctive difference. Both these rights or privileges, whichever they are to be termed, are founded on the principle of public benefit. We hear a good deal occasionally of the rights of inventors and the rights of authors, but neither can have any rights but such as are consistent with the public good. The Legislature considers it is for the benefit of the state that mechanical invention should be encouraged, that new processes of manufacture should be discovered, and that a knowledge of such inventions and processes should be secured to the public, and it therefore says to the inventor, file your specification so that all men may know your discovery, and then we will give for a term of years a monopoly of the use of the invention. So it is considered of the highest importance that the creations of genius and the results of thought and labour should be permanently embodied in writings, and those writings printed and published for the enlightenment of the nation; the state, therefore, says to authors, Give to the world the produce of your mental toil, and for a certain term of years you or your representatives shall reap the exclusive profits. But whereas the patent privilege thus granted may, for a time, check production and defer the public benefit (as in the case of a manufacturer who retains for his sole use the superior process invented, and shuts out others from employing it), the copyright privilege has the opposite effect of ensuring the public benefit at once by encouraging the printing and sale of the work, that is, the gift of the knowledge embodied therein to mankind. Copyright, therefore, has nothing of the nature of monopoly, unless, indeed, it be in the matter of price, but that, as Professor Christian long ago observed (long indeed before his enlightened views were adopted even in reference to general trade), may be safely left to the natural law of supply and demand, the interests of the author and publisher being, as a rule, coincident with those of the public. Nor let us, before leaving this branch of the subject, forget to consider for one moment how great and substantial is the public benefit which the legislation on copyright aims to secure; the accumulated thought, the continuous experience, which literature embodies, is the mark between human kind and the beasts that perish; it is that which makes man a progressive animal. Everything that tends to increase the stock of thought and experience confers a gain—everything that tends to decrease it inflicts a loss on humanity. What do we not owe to a single generation of thinkers? What did not the world lose by a single event, when the Alexandrine library perished in the flames! Copyright has been spoken of as a privilege; and so it is; but it may be questioned whether the expression can be accurately applied to the existing law of this country. Is not the term of 42 years, which is now the allotted portion of authors, to be regarded rather as a restriction? Are the statements usually made on this subject either abstractedly just, or historically true? The ancient common law right was in perpetuity—a fact sufficiently proved by evidence too various to be gone into at length here. But the records of the Star Chamber in the reign of Charles the First, and the preamble to the Licensing Act in that of Charles the Second, show that the property of the author in his work was fully recognised, and that no term of years was assigned thereto. Doubtless the common law right was subject to this grave inconvenience, that it could only be enforced by an action for damages, and as those who pirated works were generally men of straw, the remedy was, in fact, nugatory. It was probably on this consideration that the statute of Anne, the foundation of the present law, was enacted; protection was thereby limited to 14 years (no doubt borrowed from the Patent Act); but it was made efficient by the summary penalties enforceable for piracy. It seems to be taken for granted at present that this statute wholly superseded the common law, and, of course, since "Donaldson v. Becket," it is undeniable that such is the law. But it is certain that the highest legal authorities long thought otherwise. The common law judges twice expressed an opinion that the old right was still in existence. Lord Chancellor Hardwicke granted an injunction to restrain a re-print of "Milton's Paradise Lost," at a time when the copyright had expired under the Act of Anne, and there are other indisputable authorities to the same effect. It was not till the year 1774 that the House of Lords finally crushed out the perpetual property of authors by their judgment in the case above mentioned, which was delivered after taking the opinions of the twelve judges, who were equally divided on the question. All trace of the perpetual right, however, is not yet lost, it being retained by the Crown and by certain Universities and Colleges. Would it be politic to restore it to authors? It is difficult to find any reason which would justify an answer in the negative. The price would always be regulated by the wants of the public, as is shown by the cheap editions daily issued of works in which the copyright is still existing, and the only other danger to the state—that of suppression of a valuable work from individual motives—is already provided against by a section of the 5 and 6 Vict., enabling the Judicial Committee of the Privy Council to authorise the independent publication of any book which the representatives of the author may attempt to suppress. But this question is not likely to come practically before the legislature—at any rate at the present time. The present statute, obtained after a hard fight, is regarded as an equitable compromise—the bargain struck between Parliament and literature being, that the protection to the author and his representatives shall be for a long term of years, and be readily enforcible on condition that the property finally revert to the public. The history of the legislative struggle which terminated in granting the present term of forty-two years as the minimum of copyright, is very instructive, and the rival principles that have been advocated as the basis of the law are nowhere so well expounded as in the pages of *Hansard*. The shabby little term of fourteen years, under the statute of Anne, was increased to twenty-eight years by the 54 Geo. III, and the existing Act (5 and 6 Vict., cap. 45), which repealed the previous enactments, has extended the protection to forty-two years after publication, or seven years after the author's death, whichever period may last ex

pire. This great boon was obtained chiefly through the strenuous exertions of the late Mr. Justice Talfourd, when Sergeant Talfourd and a member of the House of Commons, whose own literary genius gave him a quick sympathy with the interests of authors, while his eloquence and thorough mastery of the subject ensured him the attention of the House. In the debate on February 5th, 1841, he was opposed by Mr. Macaulay, and the speeches of the two authors and orators, both marvellously lucid, are nearly exhaustive on the subject. There is a point which deserves notice in the existing law of copyright, on account of the monstrous results to which it has led. It has been laid down that copyright does not exist in any work of an immoral, seditious, or blasphemous tendency, and Lord Eldon, when on the woolsack, gave some remarkable applications to the doctrine. It was the habit of that Chancellor to refuse legal protection to any work which, having read or glanced at, he considered, on his own authority alone, to come under any of the above descriptions. He asked for no evidence, he took no opinion, but decided on his sole judgment, prejudice, or caprice, thus erecting himself into the most hateful of all despotisms—an irresponsible censorship of the press. For instance, the eminent living surgeon, Mr. Lawrence, was refused protection for his lectures at the College of Surgeons on the ground that they tended to deny the immortality of the soul, and to favour materialism. "The law," said the Chancellor, "does not give protection to those who contradict the Scriptures;" which, being rendered into English, meant, "As long as I sit here, no man shall be protected who differs from my own interpretation of the Bible." So an injunction was refused to Lord Byron for his wonderful poem of "Cain," in which the expressions put into the mouth of Satan had scandalized Lord Eldon. But the folly of these decisions equalled or surpassed their injustice. Southey, in his young days, wrote a poem called "Wat Tyler," which was outlawed by the Chancellor for its democratic opinions, and the immediate consequence was that copies of "Wat Tyler" were sold at a penny a-piece by thousands. It is an apt illustration of the fortunate truth that bigotry nearly always outwits itself. It may be said that no such decisions would be pronounced at the present day. Perhaps not; but they are unreversed, they are therefore law, and the power is a dangerous one to entrust to any individual. Save the Licensing Act of Charles the Second, the worst measure of the worst reign in our history, there is nothing so disgraceful to English jurisprudence.* The remarks by Lord Campbell, in his "Lives of the Chancellors," on this subject are well worth perusal. Mr. Hastings then observed that the introduction of International Copyright flowed naturally from the establishment of a law of copyright in all civilised countries. Literature is of no nation, and its interests are equally sacred to all. If it is just to protect the work of an English author, it must also be just to protect the work of a French, German, or American author. An Act has been passed during the present reign, having in view the carrying out of a system of international copyright, and it has to some extent been successful; but it is founded on a principle which he conceived to be radically wrong. The Queen was empowered, by Order in Council, to conclude conventions with foreign governments, and to extend to the authors of any foreign states the same privileges in this country as English authors enjoy in that state. In other words, the enactment is framed on the basis of driving a huckstering bargain in a matter which ought to be regulated by purely moral considerations. If it be only honesty and justice to give due protection to authors, whatever their country may be, England should do that duty irrespective of the conduct of others. If England would set an example in this matter all the civilised world would feel morally compelled to follow. France is, in this respect, ahead of us, and much as the repression of letters in that country is condemned, and justly so, it is certain that the Emperor has shown an enlightenment on the law of copyright which has not as yet been evinced by her Majesty's Government. It is also most desirable to consider whether a system of international registration should not be adopted, by which the lists of registered works might be transmitted reciprocally by the bureaus of different countries to each other, and registration in one country be thus made efficacious for protection in all. Having touched on the distinct subject of copyright of design, concerning which he thought the legislature should bear in mind the necessity of giving speedy remedies for any infraction of short terms of protection (having known a case in which the final judgment in favour of the inventor was given about six months after the copyright had expired), Mr. Hastings concluded by some observations on trade marks. It was a matter for congratulation that the Society of Arts had recently appointed a committee to investigate the subject, for it was one on which considerable and just dissatisfaction existed among the mercantile class. What is really wanting, and it lies at the bottom of the matter, is a system of registration. Any plan for international protection should be based on the broad and upright principle advocated with respect to copyright, that England should do justice herself without reference to the conduct of others. By the aid of those who understand the question in its political and legal aspects, a measure may be framed which will give adequate security to the productive industry of the country, and greatly diminish, if it cannot extirpate, the immorality so disgracefully prevalent which acknowledges and even boasts of frauds as dishonest as the theft of a purse from the pocket.

* Milton, in his immortal prose work, demolished the licensing system. It is a pity that "Paradise Lost" was not written in Lord Eldon's time, as it would, of course, have been denounced from the judgment seat, and a still more forcible sketch might have been drawn by its author of the bygone days of liberty, "when books were as freely admitted into the world as any other birth; when the issue of the brain was no more stifled than the issue of the womb; when no envious junto sat crosslegged over the nativity of any man's intellectual offspring."—*Areopagitica; or, a Speech for the Liberty of Unlicensed Printing.*

Seventh Ordinary Meeting.

Wednesday, January 17th, 1866; Thomas Webster, Esq., Q.C., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Barnes, James Richardson, Brookside, Chirk, near Ruabon.
Beggs, Thomas, 37, Southampton-street, Strand, W.C.
Binyon, George, 106, York-road, Lambeth, S.
Buckley, R. W., Currig Bawn, Ballintemple, Cork.
Coales, Robert, 10, Trinity-square, Southwark, S.E.
Elias, Alfred, 18, Princes-gardens, W.
Forrest, G., Springfield-house, Muswell-hill, N.
Goadby, Edwin, Loughborough, Leicestershire.
Graves, Boydell, 6, Pall-mall, S.W.
Gray, Thomas, Board of Trade, Whitehall, S.W.
Hamilton, George, 106, York-road, Lambeth, S.
Joule, Benjamin St. John Baptist, Thorncliffe, Old Trafford, near Manchester.
Mackreth, George Edward, 18, Little Tower-street, E.C.
Newmarch, William, F.R.S., Messrs. Glyn, Mills & Co., 67, Lombard-street, E.C.
Rule, Rev. W. H., D.D., 45, Bedford-street, Plymouth.
Smedley, Joseph Valentine, M.A., Oxford and Cambridge Club, S.W
Stewart, George, 47, Mark-lane, E.C.
Taylor, Samuel, 13, Manor-place, Walworth, S.
Wright, William, 32, Bucklersbury, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Dalrymple, Robert Farre, 46, Parliament-street, S.W.
Edwards, Rev. Joseph, Vicarage, Barrow-upon-Trent, Derby.
Galpin, Thomas Dixon, La Belle Sauvage-yard, Ludgate-hill, E.C.
Garrod, J., 56, Upper Thames-street, E.C.
Gideon, Henry H., 8, London-street, Fenchurch-st., E.C.
Harton, Samuel, jun., 61 and 62, Shoe-lane, E.C.
Shaw, Matthew T., 64, Cannon-street, E.C.
Smith, William Baxter, 37, King-street, Cheapside, E.C.
Southey, Thomas, Clapham-park, S.
Walker, Robert, 58, London-wall, E.C.
Watson, Charles, M.D., 1, South-crescent, Bedford-square, W.C.
White, W. W., 5, Great Winchester-street, E.C.
Wieler, William Julius, 73, Mark-lane, E.C.
Williams, William, 41, Basinghall-street, E.C.
Wontner, Thomas, 26, Bucklersbury, E.C.

The Paper read was—

AUTOMATIC TELEGRAPHY.

By Alexander Bain.

Introductory Remarks.

Electricity is, unquestionably, the most extraordinary law or force of nature. It exhibits its presence everywhere, and in everything, by the effects it produces; we see the effects in the air, the sea, and in the more solid materials of the earth; and, although we cannot see the force itself, we weigh it as it were in a balance. We can produce its effects by simple friction or by change of temperature, by chemical action, or by the motion of magnetic bodies. We can produce artificial currents for short or long periods, perhaps for any duration of time; already they have been in constant and uniform action for upwards of twenty years, and have performed well the duty assigned to them.

It would, however, be unwise in us to imagine that all the effects of this most subtile force have been discovered; it is more probable that it silently produces in nature many effects which are not observable by our senses, or at least have not yet been discovered. But be that as it may, the effects which we have already become acquainted with have led to many important results, and are still leading onward to greater achievements; and of all the purposes to which this force have been applied the telegraph seems to be the most wonderful. It is now capable of conveying our thoughts hundreds of miles far faster than we can think them, and many times faster than we can write them. In doing this it will travel overland through conductors, and back again by similar paths, or it will travel out by the earth or sea and return through other conductors, or it will travel out by conductors and return by the earth or sea. It will print our thoughts on paper in common type, or it will merely exhibit them to the eye. It will write autograph letters hundreds of miles away, and it will draw our attention by audible sounds. It will tell mariners at our seaports the exact Greenwich time to less than a second by the falling of a ball, whereby they may regulate their chronometers without leaving their ships. By it we can regulate all the clocks in a town, or even work them throughout the whole kingdom, or find the longitude of places with far greater accuracy than could ever be done before. By it we can sound the deepest sea, and it will tell the mariner the instant the lead touches the bottom. It can work the machinery of our lighthouses and produce the light at the same time, besides many more purposes of utility too numerous to be described here.

Of all the effects produced by this force, magnetism has hitherto been the most extensively used for telegraphy. This seems to have arisen from the fact of its being more easily applied, and for some special purposes it is unquestionably the best; for instance, for the pur-pose of working the traffic of railways, where but few signals are necessary to be transmitted at one time, or between establishments at moderate distances, where but few messages are sent and but a few words in each, there can be nothing better used than electro-magnetic instru-ments, which can be in the form of letter-showing appa-ratus so that any one can work them without previou teaching.

But when we come to general telegraphs for publi use, which are often hundreds of miles in length, an the messages very numerous and often very long, th case is far different, and is presented to us in a ver different aspect. Here, for various important reasons which will be presently explained, we find the chemica effects of electricity are far better for our purpose tha the magnetic effects.

Automatic Telegraphy.

Automatic telegraphy consists of methods of trans mitting and receiving previously-composed messages be tween distant places by means of self-acting machiner in connection with electric circuits, and where properl carried out, it is distinguished from common telegraph by the great celerity with which messages can be sen and received, as well as by the great accuracy i ensures in the transmission and reception of intelli gence. Indeed, the advantages it offers has appeare to the writer of this paper so vast, that he has devote to it much thought, time, and labour. He was in duced to do so from the following reasons, viz., seeing that the action of the human hand, however expert could never take a tithe of the advantage of the spee of electricity, and also that the use of numerous wire was very objectionable in consequence of the increase expense, but far more so from the great difficulty o obtaining good insulation among many wires of grea lengths. At the time he first turned his attention to th subject of electric telegraphy several wires were use for each pair of instruments, and never less tha three, in consequence of which he endeavoured t contrive methods for reducing the number of wire and soon succeeded in producing instruments ca pable of working on a single circuit, and afterwar succeeded in working with a single wire, having di covered that the earth might be used with gre advantage for one half of the telegraphic circuit. A this property of the earth is unquestionably a mo extraordinary phenomenon, and still remains a parad even to scientific men, and plays now a most importa part in telegraphy throughout the world, and as t discovery has been independently made by others as w as the present writer, it will be well to give the ideas scientific men respecting it, for instance, the writer mathematical and physical science in the "Encyclopæd Britannica," eighth edition, vol. I., p. 986, observ under the head of "The Earth Circuit,"—"There one circumstance connected with the electric telegra deserving of particular notice, I mean the apparent infinite conducting power of the earth when made act as the vehicle of the return current. Setting theory aside, it is an unquestionable fact that if a te graphic communication be made, suppose from Lo don to Brighton, by means of a wire going thith passing through a galvanometer, and then retur ing, the force of the current shown by the g vanometer at Brighton will be almost exactly double if, instead of the return wire, we establish a good co munication between the end of the conducting wire a the mass of the earth at Brighton, the whole resistan of the return wire is at once dispensed with. This f was more than suspected by the ingenious M. Steinhe in 1838, but, from some cause or other, it obtained lit publicity; nor does the author appear to have exer himself to remove the reasonable prejudice with whi so singular a paradox was naturally received. A m ingenious artist, Mr. Bain, established for himself t

principle, and proclaimed its application somewhat later, and, in 1843, perhaps the first convincing experiments were made by M. Mateucci, at Pisa."

Again, Lardner observes that "of all the miracles of science surely this is the most marvellous. A stream of electric fluid has its source in the cellars of the Central Electric Telegraph Office, Lothbury, London; it flows under the streets of the great metropolis, and, passing on wires suspended over a zigzag series of railways, reaches Edinburgh, where it dips into the earth, and diffuses itself upon the buried plate. From that it takes flight through the crust of the earth and finds its own way back to the cellars at Lothbury."

Instead of burying plates of metal, it would be sufficient to connect the wires at each end with the gas or water-pipes, which, being conductors, would equally convey the fluid to the earth; and, in this case, every telegraphic despatch which flies to Edinburgh along the wires which border the railways, would fly back, rushing to the gas pipes which illuminate Edinburgh, from them through the crust of the earth to the gas-pipes which illuminate London, and from them home to the batteries in the cellars at Lothbury.

Although the automatic system has met with much opposition and neglect for a period of nearly twenty years, the writer thinks the time is fast approaching when the increasing requirements of the public will compel its general adoption; indeed, this necessity is partially shown by the number of telegraph inventors who have brought forward machines on the same principle during late years; but it is more clearly shown by the huge double ranges of numerous wires we already see stretched in all directions over the country, causing a vast (first) outlay, and a continual unnecessary expense to keep in order; but, setting the matter of cost aside, let us look at the working effect. It is well known that in damp and foggy weather, however well insulated the wires may be, small portions of the electric fluid will escape, from wire to wire, at all the points of suspension, and often from one to all on the same line of posts, especially between the longer and shorter wires, causing confusion among the instruments, and this confusion is greatly increased when many instruments are working at the same time.

Again, when storms arise, numerous wires, especially when near each other, present so large and compact a surface to the gale, that they are far more liable to be broken or blown down than one or two would have been, especially when snow or ice collects upon them. Should this take place to a considerable thickness, a heavy gale must exert an enormous force against them, so much so, that the posts or wires must give way (as has recently happened), very likely both. And when such a disaster takes place, what is the result? Why, it will take as many weeks as it would days were there only one or two wires to repair, causing an immense loss to the public, as well as to the companies themselves, leaving the great cost of repairs out of the question.

Yet notwithstanding these well known facts, these double ranges of many wires are stretched within a few inches of each other for hundreds of miles amidst the humid air of this country. Among numerous wires the fluid has thousands of chances of escaping from one to all, or any of the others. These chances are invariably seized, and hence deranged action of the instruments, causing mistakes, repetitions, general confusion, and consequent delay, and every additional wire put up only adds to the difficulty. In consequence of the foregoing reasons, the chief object of every telegraphic engineer should have been to contrive instruments of the greatest possible celerity, for the purpose of doing as much work as possible with a single wire. With a view to that end the writer turned his attention to the subject of automatic telegraphy at an early date, and in 1843 patented an automatic copying telegraph. Diagrams of these instruments are shown. They consist of two powerful pendulum clocks, and two smaller pieces of clockwork; these last are moved by weights, which consist of metal frames, in each of which is placed a plate, N, composed of conducting and non-conducting materials, in the following manner:—A frame is filled with short well insulated wires parallel to each other, and then filled in with sealing wax, so that the whole forms a perfectly compact body; the two flat surfaces are then ground perfectly smooth, and are permanently fixed in the metal frame, at the back of the plate, in which may be placed either a composed form of printers' types or any other surface which may be desired to be copied at a distant station, and chemically prepared paper at the receiving station. Each of the pendulums carries a metallic arm, the points of which act as tracers on the surface. Now let us suppose one frame filled with a previously composed form of printer's types, and the other frame with chemically prepared paper. The electric current will flow from the positive pole of the battery to the type, from thence through the small wire to the tracer, up the pendulum to the long telegraph wire, down the pendulum rod of the receiving instrument, through the tracer to the short wires, and from thence to the chemical paper, forming thereon a series of small dots, corresponding with the forms of the types at the transmitting station. The magnets to the left of the clock movements release the small clock-work so as to allow the frames to drop through a small space at every vibration of the pendulums; the pendulums regulate each other at each vibration to the left.

The writer believes that this was the first copying telegraph ever contrived, but as the plan required that all the instruments should go sinchronously together, or that several wires had to be used, either of which he soon saw would produce too many difficulties for practical use, it was proceeded with no further, and is only noticed here to show that the invention of that class of scientific toys, called copying telegraphs, is much older than many imagine.

Having by the foregoing efforts gained much experience, although he had arrived at little satisfactory results in automatic telegraphy, he decided to compose the messages in some simple telegraphic characters by mechanical means, and after much labour, and the trial of many methods, he was fortunate enough to hit upon the plan of composing the messages by means of punching groups of perforations in paper, in such manner that each group represented a letter, numeral, or other sign, which has turned out to be a most simple and efficient plan. At first the punches were operated by hand, without the aid of machinery, and the working was consequently rather slow, but the writer having subsequently contrived machinery for the purpose, they can be now worked with great rapidity.

Of all the known effects produced by electricity, the chemical has been found by the writer best suited for automatic telegraphy, principally because it is quicker in its action than any other, having nothing of ponderability to move, and consequently no inertia to overcome.

Electro-magnetism, it is true, would answer to some extent, but in that case ponderable bodies had to be moved with great rapidity by the electro-magnetic force, and on long telegraphic lines the force being small, all the mechanical actions produced by it must be of necessity very delicate, and require fine and delicate adjustments, which have to be often varied with the varying strength of the currents. Besides, delicate mechanical actions are always liable to get out of order; so that, after much thought, and numerous experiments with the magnetic as well as the chemical effects of electricity, the writer decided to use the latter only for his automatic system, as the currents would have nothing to perform but decomposition at the point of the chemical pen, the machinery being worked by other power.

In order to show how the chemical property of the current may be made to produce visible marks or signs, let us suppose a sheet of paper, wetted with an acidulated solution of ferro-prussiate of potash, and laid upon a

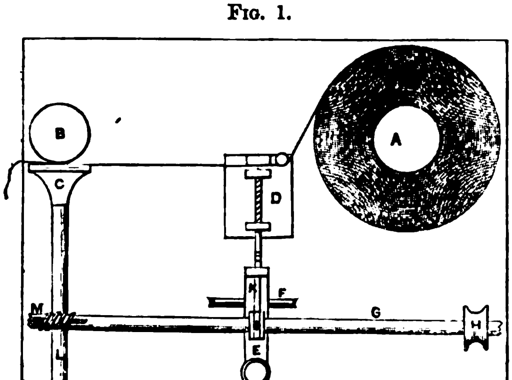
plate of metal, and let the point of a steel, or copper style, be applied to it so as to press it gently against the metallic plate. Let the style be now put in metallic connection with the wire which leads to the positive pole of a voltaic battery, and let the metallic plate upon which the paper is laid be put in connection with the wire which leads to the negative pole. The current will, therefore, flow from the style through the moistened paper to the metallic plate, and it will make a blue or brown spot thereon according as the style is of iron or copper.

If the paper be moved under the style while the current flows, a continuous line will be traced upon the paper. If while the paper is thus moved the current is permitted to flow only during intervals of long or short duration, the paper will be marked with lines long or short, according to the intervals during which the current flows; there being no mark made during the suspension of the current. The long or short lines thus traced upon the paper will be separated one from another by spaces more or less wide, according to the lengths of the intervals of suspension of the current. It is evident that the same effects will be produced, whether the style be at rest and the paper moved under it, or the paper be at rest and the style moved over it. The paper may be moved under the style by various mechanical expedients. It may be in the form of a ribbon coiled upon a roller, and drawn under the style, which was one of the writer's first plans, or it may be in the form of a common square sheet and wound upon a cylinder, to which could be given a revolving motion, and at the same time receive a slow motion in the direction of its axis, so that the course of the style upon it would be that of the thread of a screw or helix; this was also one of the plans the writer adopted in his early experiments, but the plan he has found most convenient in practice is to cut the paper into the form of circular discs, of about 18 or 20 inches diameter, and after being chemically prepared, any required number are laid upon a metallic disc of equal size. To this disc is given a motion of revolution round its centre, in its own plane, by clockwork, or any other convenient power, while the style receives a slow motion directed from the centre of the disc towards its edge. In this case the style traces a spiral curve upon the paper, winding round it continually, and at the same time retiring constantly but slowly from its centre towards its edge.

Punching Machine.

Fig. 1 represents a plan of so much of the punching machine as will explain the principle of its action. A is a

Fig. 1.



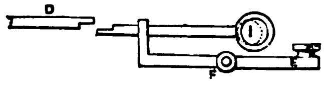


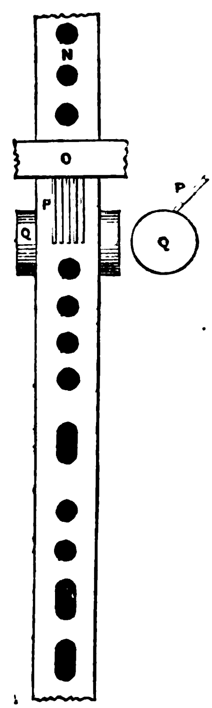
Fig 2 (*Elevation.*)

roll of ribbon paper; B and C are two revolving discs for the purpose of drawing forward the paper from off the reel; D represents the punch; E a finger key, with its axis at F; H is a pulley which receives rapid motion from a wheel driven by the foot, similar to that of a sewing machine; I is an eccentric on the shaft G, which gives rapid to-and-fro motion to the rod K, on the rod G; at L there is a screw which works into, and gives motion to, a wheel, M, which is on the shaft of the disc C. It will be observed that when the pulley H receives motion from the band, the eccentric I gives rapid to-and-fro motion to K, at the same time the screw at L gives a slower motion to the wheel M and the discs C and B, which draw forward the paper in front of punch D. Now, if the finger key is pressed down at E, (shown in elevation by Fig. 2.) the other end of the key will raise the rod opposite the punch, which will be pressed forward rapidly and punch the paper. If the key is pressed but for an instant a short hole will be punched, but if kept down for a longer interval a longer hole will be punched. In this way groups of short and long holes can be punched at pleasure representing letters, words, and sentences, and thus messages can be composed of any length and with considerable celerity. These messages can then be carefully compared with the manuscripts from which they were taken and, if needful, corrected before being placed in the transmitting machine, so that no mistake should ever be sent along the line.

Transmitting Apparatus.

Fig. 3 is an enlarged view of so much of the trans-

Fig. 3.



mitting apparatus as will explain the principle of its action. N is a portion of paper ribbon with groups of perforations, each group being supposed to represent a letter of the alphabet; O is a metal bar in which are fixed five metal springs in the form of the teeth of a comb; Q is a metal roller insulated from O, except at the points of the springs P. Now let O and Q be in the telegraph circuit, and the paper drawn through, as it may be, with great rapidity, when the perforated portions of

Fig. 6.

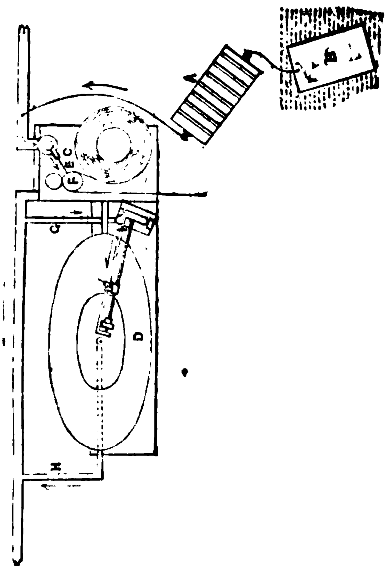


Fig. 5.

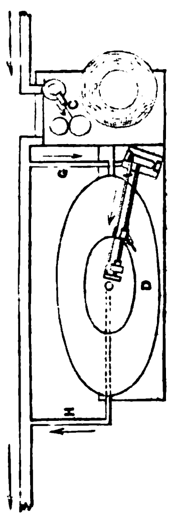
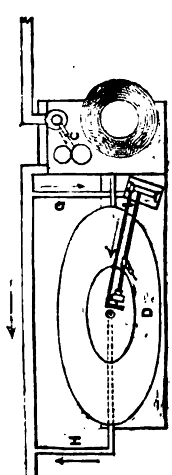


Fig. 4.



the paper pass under the springs they come into contact with the roller G, and the current flows through the circuit, and when the unperforated portions of the paper are under the springs the current is interrupted thereby. In this way electric currents can be sent through telegraph circuits with extraordinary rapidity and perfect accuracy in their duration and grouping.

Receiving Apparatus.

The receiving portion of the apparatus is a revolving disc carrying chemically-prepared paper, and a metal frame carrying a revolving screwed shaft; on the upper end of this shaft is fixed a roller, which lies gently on the disc. The screwed shaft carries a style-holder. As the disc revolves it gives motion of rotation to the roller, and consequently to the screwed shaft, which causes the style-holder to recede slowly but constantly from the centre towards the outer edge of the disc. Now let us suppose the apparatus properly arranged in the telegraph circuit, as is well known, the currents from the comb and roller at Fig. 3 will pass through the style into the chemically-prepared paper at the receiving station, and make marks thereon corresponding exactly in their lengths and their grouping with the perforations in the paper shown at Fig. 3.

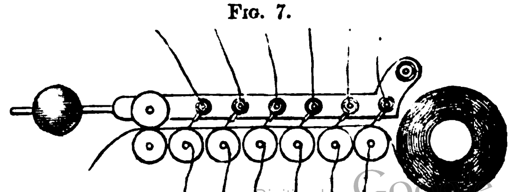
Having thus described the principal actions of the composing machines, and also of the transmitting and receiving apparatus, let us now proceed to show how they are combined so as to form a complete system.

The author proposes to have only two wires at most on one line of posts, one to be called the up wire, and the other the down wire, so that messages can be transmitted in both directions at the same time. The messages are transmitted by the apparatus through the main wire in the manner shown at Fig. 3, but his experience has shown him that the best way to receive the messages is through branch circuits, so as to keep the main wire contacts always complete, except in the process of transmission. Figs. 4, 5, 6, represent three different stations on a telegraph line. A represents a galvanic battery, C the transmitting apparatus, and D the receiving portions at each of the stations; the transmitting and receiving apparatus, it will be observed, are moved by the clock mechanism at C, the instrument (Fig. 6) is shown in the act of transmitting. Figs. 4 and 5 are shown in the position of receiving. Although only three instruments are shown, there may be any desired number on the same line.

The action is as follows:—The current passes from the battery A to the main wire, from thence to the spring E, through the perforations of the paper to the roller F, then to the frame of the clock-work, and from thence to the main wire, but at each of the intermediate stations, when they are necessary, a portion will pass down through the ends of the branch circuits at G, to the frames I, through the styles to the chemical paper, and will return by the end H to the main wire. In this way the currents are made to write a copy at every station on the line, but at the stations where copies may not be desired, all that the operator has to do is to lift up the pen from the paper, and let it stand in the position shown at Fig. 6, or he may turn back the penholder frame altogether away from the disc.

Fig. 7 shows a method by which a despatch can be transmitted from a central station, say from London, to

Fig. 7.



any number of telegraph lines simultaneously, so that the despatch may be received and written at any number of towns on each line, in the way already described.

This system has been proved electrically, chemically, and mechanically in England, France, and America. It can transmit intelligence from London to the farthest corner of England or Scotland at the rate of, in round numbers, six words per second, 333 per minute, 20,000 per hour, and with a degree of accuracy never before obtained by any other system, and, further, it can automatically transmit despatches of any length from any place, say from London to all the principal towns of England simultaneously at the above-named degree of celerity.

DISCUSSION.

Mr. OWEN ROWLAND said he fully expected this evening that Mr. Alex. Bain would have had with him some instrument to afford the meeting practical proof that he had mastered the great difficulties of automatic telegraphy. There was no doubt that within the last week the electric telegraph had made its usefulness felt more than it ever had done from the earliest date of its introduction; for its failure, owing to the destruction of the wires by the snow, had been most severely felt by all classes throughout the country, and showed the necessity of guarding as far as possible against such an accident for the future. Looking to the generally recognised importance of the system, he thought that an extensive failure like that which had just occurred should, as in the case of railway accidents, be a subject of close inquiry. There was no doubt the present state of electric telegraphy was not so satisfactory as it ought to be. The improved instruments which had been invented by such ingenious men as Wheatstone, Bain, Morse, and Hughes, though their merits were recognised in other countries, had been but little introduced here; but the time would come when shareholders in these great companies would insist upon knowing why this was the case. He feared it was, in some instances at least, owing to the officers of companies being commercially interested in inventions of their own. As proprietor and one of the editors of the only public journal devoted to the science of electricity, a vast number of communications reached him from all parts, the burden of which too frequently was the quarrels between patentees, and he felt thankful that he was not himself a patentee. In the year 1863, he was appointed by the Earl of Shrewsbury referee, in conjunction with the Mayors of Liverpool and Manchester, to test the relative merits of Professors Hughes and Bonelli's systems. On the latter plan, five series were used, and were capable of transmitting 20,000 words per hour, or about 330 per minute. One young lady was able to "set up" twenty to twenty-five words in about 85 seconds, so that the telegraph could keep fifteen compositors at work. The action of that telegraph was very beautiful, but the great drawback was, that it required five wires to work it. Mr. Bain claimed to be able to do the same amount of work with one wire, which brought his system nearer to that of Professor Hughes,* which also consisted of one wire, the messages being delivered in ordinary Roman type. One hundred to one hundred and twenty-three revolutions of the wheel per minute at five words per revolution would give 615 letters per minute, or an average of 45 words per minute. This system, though greatly opposed in this country, had been extensively adopted in France. By the Morse system with one wire the speed was 30 words per minute, the average being about 25. The bell telegraph, one of the systems employed by the Magnetic Telegraph Company, with one wire would transmit 50 words per minute, or an average of 30 to 40. He (Mr. Rowland) witnessed the transmission of the Queen's speech to Paris last year by this system at the rate of 40 words per minute. By the double needle system with two wires the speed was 35 words per minute, or an average of 23 to 28. With the single needle and one wire the speed was 25 words per minute, or an average of 15 to 20 words. He had seen another instrument, lately invented by Professor Wheatstone, which was thoroughly automatic, by which a message placed in the machine was reproduced at the distant end of the circuit. This was capable of transmitting 600 letters or 120 words per minute, through a circuit of 400 miles—a result which he had himself witnessed—without a single failure; and yet notwithstanding all the years of toil and trouble that had been devoted to it, with the addition of the brilliant name of Wheatstone, it had not been practically introduced to any large extent. The simplicity of the instrument was such that it was almost impossible for it to get out of order. He felt great pleasure in laying these facts before the meeting, and was sure they would all feel indebted to Mr. Bain for having introduced this subject to their notice.

* See *Journal*, vol. VII., p. 334.

Capt. SELWYN, R.N., remarked in reference to Mr. Bain's system that it was no longer necessary to telegraph by dots and dashes, nor was synchronism between the two instruments requisite. It was perfectly possible to telegraph through a single wire at a speed of 36 words per minute, by means of a single instrument which could be worked by a child seeing it for the first time. The message was transmitted in Roman characters at the rate he had stated by the mere effort of turning a handle, and that system was in operation on some portions of the French railways. It was very interesting to hear of such excessive rates of speed, but it was important to know whether that speed included the transcribing the message (which might be said to be in cypher), and sending it out of the office, because if that were not the case, no fair comparison could be made with Bonelli's system. They were told that to fully work a single instrument at that speed would require fifteen telegraph clerks, which was, in fact, impracticable. They could not have fifteen clerks at a station all night long—they rarely had more than one. These were points which inventors did not sufficiently consider. They put forth a very magnificent speed, but they did not regard the practicability of the thing in its application to ordinary every-day work. When they obtained thirty-six words per minute, that was about the quickest writing that a skilled penman could accomplish, and if that rate of transmission were effected, they would have done quite as much as the present age expected. He was, however, not one to limit the progress of science, and he believed they would soon arrive at a complete codification of words which would increase the rapidity of transmission to an enormous extent. The letters A, B, C, for instance, might represent a whole sentence, and he thought that was a more practical way of obtaining speed than any extraordinary rapidity of working the instruments. Moreover, the speeds spoken of that evening implied perfect insulation, while it was known that the fogs and snowstorms materially interfered with the working at the speed contemplated by inventors. He need not say, before such an audience as he was addressing, no such thing as perfect insulation existed; and as a general rule the instruments in use signalled quite as rapidly as the wires could transmit. The great question which forced itself upon their attention was the utter insufficiency of the principal insulatory materials at present employed, more especially for underground wires, the improvement in which had no doubt been retarded by the interest which had been created in favour of high-priced gums, and sufficient attention had not been given to materials of less cost and lower indicative capacity. He expected to see the time when a material would be found so indestructible in its nature that it could be employed for the insulation of subterranean wires so as to obviate the present system of suspended wires; and when one saw the distorted poles, the displaced tiles, and the loose telegraph wires hanging in such

admired disorder over the houses and streets at the present time, they must come to the conclusion that suspended wires were a mistake. The necessities of the case had no doubt given rise to the present system. The pole telegraphs were constructed in the first place with one or two wires suspended on poles of sufficient strength to support them; but as business increased, it was necessary to add more wires upon the same poles, which were strengthened as far as possible to carry the additional weight, and under these circumstances it was not to be wondered at that when an unusual stress came upon them they failed. The desirability of resorting entirely to subterranean lines of telegraph seemed manifest. The reason they had not been adopted to a greater extent was owing to the rapid destructibility of the insulating materials employed. As he had before observed, they had not sought for other substances for that purpose than those which had been presented to them, but he might state that he had lately tested the material known as paraffin with the best results. He should not venture to speak on this subject from his own experiments alone; but he had been assisted in them by some of the best electricians of the day, including Professor Miller, of King's College. It was a most indestructible material, and was superior in lowness of inductive capacity to any insulating material that had hitherto been produced. If they could give to the telegrapher the material he required as an insulator, it would be neither to the interest of the shareholders or the public to persist in the use of antiquated materials or antiquated processes in telegraphy.

Mr. Owen Rowland inquired of Capt. Selwyn whether he he had tested paraffin, especially under varieties of temperature, say from 60 degs. to 72 degs.

Capt. Selwyn replied that paraffin itself, of course, melted at a low temperature, but mixed with india-rubber in certain proportions, which was the form in which he had tried it, it did not yield to a lower temperature than gutta-percha. Moreover, when that mixture was vulcanised by the cold process, it resisted a temperature of 600 degs. without the least damage.

The Chairman in proposing a vote of thanks to Mr. Bain for his communication, remarked, that this subject had not been brought before him as an entire novelty, but as an invention many years old, then imperfect in its details, and now greatly improved. That was the main object of the author's paper. Mr. Rowland and Capt. Selwyn had adverted to the various interests which operated to prevent the introduction of great improvements in electric telegraphy; but it was to be borne in mind that there were also strong interests at work to promote them. When a science like this had advanced to a certain stage, and where large sums of money had been expended upon the existing means and processes of telegraphy, those who were in possession of these systems were generally the last persons to introduce any radical improvements. They were satisfied with things as they were so long as they realised a fair return for their money; they were essentially conservative in their principles; and they liked to let well alone. The introduction of such a system as that of Mr. Bain and other inventors would involve the sacrifice of a large portion of the capital already embarked in the present undertakings. That so great an improvement in the speed of transmission of messages would ultimately make its way there could be no doubt, and he conceived that the bringing the subject before a Society like this, whereby the community were made acquainted with the most recent advances made, was the best means of forcing them upon public attention. He was somewhat surprised that no gentleman had risen in defence of the existing systems and in opposition to the suggestions which Mr. Bain had laid before them. He was struck with the observation of Capt. Selwyn, that one of the matters to which they ought to give special attention was the different gums and materials adapted for insulating purposes, for the experience of the last few days would satisfy them that the sooner they gave up the system of poles and wires the better. It had been known for years that they might have a perfect system of electric communication by wires under ground, but that was a question of an expense very much greater than the pole system. Besides, it had been found that neither gutta-percha nor its compounds, nor india-rubber nor its compounds, could be absolutely relied on for the purposes of subterranean telegraphy. Therefore, it was not only the question of expense which deterred companies from adopting the underground system, but the extreme uncertainty of the insulating materials. It was well-known that gutta-percha was subject to various influences which deteriorated its properties, and, to that extent, companies might be justified in not adopting it, even if it had been of less expense than the pole system. The occasional inconveniences of that system were, however, notorious, aad the inconveniences to which the last week had subjected the community, would probably lead to the reconstruction of the whole system, and if Capt. Selwyn and others, who had the opportunities of experimenting upon guns and other insulatory materials, would communicate the results, they would confer an important benefit upon the public at large, as nothing was more wanted than a substance that could be thoroughly depended upon as an insulator. Assuming a good material and good means of communication to be provided, the next question was with regard to the instruments to be employed for the transmission of the messages; and upon that subject he sympathised with the observations of Mr. Rowland, as to the squabbles which existed among patentees and inventors. He had a high opinion of Mr. Bain's automatic system; and from that gentleman's long absence from this country he might probably not have been aware of the advances which had been made in Wheatstone's and other systems, but still it was to be remembered that Mr. Bain was one of the first to bring this system forward, and the public were indebted to him as one of the pioneers in this great work. Mr. Bain had laid before them, in a very clear and able manner, the general principles of his automatic telegraph, and for having done so he was sure the meeting would tender that gentleman their best thanks.

The vote of thanks was then passed and acknowledged.

The following extracts will be read with interest as showing the results obtained by Mr. Bain's system, particularly in America :—

"*Communication on the Electric Telegraph.*—The President of the Society for the Encouragement of National Industry, Paris (Session May 8th, 1850), announced that Mr. Bain had arranged in the hall his ingenious system of electric telegraphing, of which M. Sequier had during a previous session given a description, which greatly interested the members of the Society.

"The Abbé Moigno was invited to give an explanation of this apparatus, to which invitation he quickly responded.

"In this consists the ingenious mechanism of this apparatus, to which the author has given the name of electro-chemical telegraph, to distinguish it from the electro-magnetic telegraphs now in use.

"The message wished to be transmitted is written on a piece of long narrow paper by cutting, with the aid of a punch, the letters of a very simple alphabet composed of points and horizontal lines. This band is rolled on a wooden cylinder, and then unrolls itself with the aid of a crank, so as to pass on a second metallic cylinder, which supports four little springs which communicate with the conducting wire of the line; the metallic cylinder is connected with the pole of a battery of small volume and very simple construction.

"The band of paper presents in turn a covered part and a vacant space; this last represents the letters of the alphabet, whilst the covered are of paper—that is to say, an insulating substance. When the small springs

rest on the paper, the circuit is not formed, and the current does not pass, but as soon as the springs touch an empty place they are in contact with the cylinder, from that time the communication is established, the current circulating and arriving instantaneously at the station.

"There a small style is attached to the conducting wire of the line; below this style turns a metallic plate, which is covered with a disc of paper, chemically prepared by dipping it first in a solution of sulphuric acid and afterwards in a solution of prussiate of potash. The plate, and the disc with which it is covered, communicate with one of the poles of the battery at the station of arrival. The current is afterwards completed through the earth.

"The despatch is transmitted in the following manner:—At a given signal the style is applied to the chemical paper at every empty space on the band of paper, which is unrolled by the crank, the current passes, and, under its influence, the point of the style, by the chemical action which it exercises, traces a point or a little line of a very dark colour, which is the representation of the letter which must be reproduced at a distance.

"The band on which an entire page is written unrolls itself with extreme rapidity, the plates, drawn by a clockwork movement, turn also with great quickness. After 45 seconds the 1,200 letters composing this page appear very neatly drawn on the discs of the chemical paper, and were thus faithfully reproduced, and would have gone two or three hundred leagues further without any difficulty. The movement printed on the plate is a spiral one, so that successive lines do not interfere with each other, but remain entirely distinct.

"These are the advantages which the author attributes to his system:—1st, more accuracy and simplicity in the primitive construction. 2nd, More rapidity in the transmission of the despatches by a single wire with a good insulation."—*Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, 6th May, 1850, p. 236.

Extracts from *Lardner's Museum of Science*, on Bain's Chemical Telegraph:—

"The following experiment was prepared and performed at the suggestion and under the direction of M. Leverrier and myself:—Two wires extending from the room in which we operated to Lille, were united at the latter place, so as to form one continuous wire extending to Lille and back, making a total distance of 336 miles. This, however, not being deemed sufficient for the purpose, several coils of wire wrapped with silk were obtained, measuring in their total length 746 miles, and were joined to the extremity of the wire returning from Lille, thus making one continuous wire measuring 1,082 miles. A message consisting of 282 words was then transmitted from one end of the wire. A pen attached to the other end immediately began to write the message on a sheet of paper moved under it by a simple mechanism, and the entire message was written in full in the presence of the committee, each word being spelt completely and without abridgment, in fifty-two seconds, being at the average rate of five words and four-tenths per second."

A report of the directors of the New York Bain Lines states that messages are transmitted by them, without being re-written, from New York to Buffalo, a distance of 500 miles. This is done without any intermediate relay batteries or magnets.

Extract from a work entitled "History, Theory, and Practice of the Electric Telegraph." By George B. Prescott, Superintendent of Telegraph Lines, Boston, U.S., America:—

"*Bain's Electro-Chemical Telegraph.*—The next system of telegraphy, in order of its invention and introduction in this country, is the chemical, invented by Alexander Bain, of Edinburgh.

"Mr. Bain obtained a patent for his system in England in 1846, and applied for one in this country in 1849, but was refused upon the ground of infringement upon the Morse patent. It seems to have been the opinion of the commissioner that Mr. Morse held the exclusive right to electricity in any form in which it could be used for telegraph purposes, and that he was placed at the head of the Patent department solely to maintain it for him. Supposing this decision final, Mr. Bain left Washington to return to England, but was met in New York by Mr. Henry O'Reilly, who induced him to appeal to the Supreme Court. He did so, and the decision of the Commissioner was over-ruled, and Judge Cranch ordered a patent to be issued to him.

"Immediately on the granting of this patent, a number of public-spirited and enterprising merchants of New York and Boston set themselves to work to build an opposition line between New York and Boston, to be worked upon this system. The monopoly which had existed since the telegraph lines had been first established was so unpopular, that the construction of this line was hailed as a public blessing.

"The line was completed in the autumn of 1849, and the tariff between the two cities reduced from fifty cents to thirty cents per ten words. The line worked admirably —better than any had previously worked in this country, and business increased so fast that it was necessary to put up another wire at once. In the meantime lines working upon this system were constructed between New York and Buffalo, between New York and Washington, New Orleans, Louisville, and Cincinnati, between Boston and Montreal, and between Boston and Portland.

"From this date a new era seemed to open in the telegraph world; business increased rapidly; tariffs were reduced; lines improved in reliability; and public confidence began to be secured for the first time.

"Early in the winter of 1849, the proprietors of the Morse patent commenced suits, for the infringement of their patent, against the New York and Boston and New York and Washington (Bain lines). These suits were kept in court for nearly three years, when it was clearly evident if they were pressed for decision upon the merits of the case, the Morse patents would be destroyed, and the system thrown open to the world. This result was, of course, not to be desired by either party, and they therefore agreed to consolidate their lines, and use but one patent.

"The lines thus consolidated between New York and Boston were called the Union lines. They now use the Morse system, as they do upon all the other consolidated lines.

"There is at present but one Bain line in operation in this country, the one from Boston to Montreal. The Bain system, if not the simplest, is one of the simplest forms of telegraphy ever worked.

"No magnetism is used, and only the chemical effects of the electric current are necessary. A metallic disc, carried at a regular uniform speed by clock-work, receives a sheet of prepared paper. Upon the paper rests a screw plate, which serves to guide a pen in regular spiral lines from the inner to the outer surface of the disc, the circuit is what is known as the open circuit—that is, the key which throws the current from the battery on the line is always open when a message is being received from a distant station, and the current passes through the chemically prepared paper to the earth without uniting with the home battery, the negative pole of which is invariably connected with the earth, and the positive pole, by the depression of the key, with the line.

"This system has some advantages over every other which has been used in this country, not the least among which is its ability to work through a heavy thunder-storm, which none of the other systems can do without considerable danger, both to the operators and instruments.

"Another considerable advantage which it possesses is its ability to work over a greater escape than any other. We have known the line between Boston and

New York to do business during a heavy rain storm, with the wire actually lying on the ground. This system is capable of working a greater distance without the aid of relays than any other, and of working with a smaller battery.

"We have worked well between Boston and New York with but 10 cups of the Grove battery, all told, and have worked well between Boston and Buffalo, *viâ* New York City, without the intervention of repeaters or auxiliary batteries."

Mr. Joseph Whitworth, as one of the British Commission sent to the New York Exhibition of 1854, presented a report to Parliament, which has been published, and which supplies some interesting particulars. According to Mr. Whitworth, the most distant points connected by electric telegraph in North America are Quebec and New Orleans, which are 3,000 miles apart. and the network of lines extends to the west as far as Missouri, about 500 towns and villages being provided with stations. There are two separate lines connecting New York with New Orleans, one running along the sea-board, the other by way of the Mississippi, each about 2,000 miles long. Messages have been transmitted from New York to New Orleans, and answers received, in the space of three hours, though they had necessarily to be written several times in the course of transmission. When the contemplated lines connecting California with the Atlantic, and Newfoundland with the main continent, are completed, San Francisco will be in communication with St. John's, Newfoundland, which is distant from Galway but five days' passage. It is, therefore, estimated that intelligence may be conveyed from the Pacific to Europe, and *vice versa*, in about six days.

The cost of erecting telegraph lines varies according to the localities, but the expenses upon the whole are estimated to average about 180 dols. (£36) per mile throughout the States. The moderate amount of this estimate is, in a great measure, to be attributed to the facilities afforded by the general telegraph laws for the formation of companies and the construction of lines.

The electric telegraph is used by all classes of society as an ordinary method of transmitting intelligence. Government despatches, and messages involving the life or death of any persons are entitled to precedence; next come important press communications; but the latter, if not of extraordinary interest, await their regular turn.

The leading newspapers of New York contribute jointly towards the expenses of daily telegraphic communication. The annual sum paid by the "Associated Press" averages 30,000 dollars per annum. The following is the tariff for the press despatches:—

Under 200 miles,		1	cent	per word.
Between 200 and 500	,,	2	,,	,,
,, 500 ,, 700	,,	3	,,	,,
,, 700 ,, 1,000	,,	4	,,	,,
,, 1,000 ,, 1,500	,,	5	,,	,,
,, 1,500 ,, over	,,	6	,,	,,

Assuming three cents as the average, the total amount of matter received by telegraph for the New York Associated Press amounts to a million words per annum, or about 600 columns of a London newspaper of the largest size, averaging almost two columns per day. Supposing six papers to be associated together, the share of each would annually amount to about 5,000 dollars, or £1,000, for two columns of telegraphic intelligence daily.

Commercial men use the electric telegraph in their transactions to a very great extent. In 1852, there were transmitted by one of the three telegraph lines that connect New York and Boston between 500 and 600 messages daily. The sums paid on this line by some of the principal commercial houses who used it, averaged in 1852 for each from 60 dols. (£12) to 80 dols. (£16) per month. On other lines the leading commercial houses were estimated to pay from 500 to 1,000 dollars (£100 to £200) per annum for telegraphic despatches.

Interruptions occur most frequently from the interference of atmospheric electricity; in summer they are estimated to take place on an average twice a week, but many contrivances have been adopted for obviating this inconvenience, such as lightning arrestors, &c., which are generally known, the number of interruptions having been thereby reduced about 30 per cent. Other accidental causes of interruption occur irregularly from the falling of the poles, the breaking of the wires by falling trees, and, particularly in winter, from the accumulated weight of snow or ice.

The electric current is made to act through long distances by using local and branch circuits and relay magnets in those systems where it would be otherwise too weak to operate effectually. In Mr. Bain's system a weak current is found sufficient for very long distances; between New York and Boston, a distance of 270 miles, no branch or local circuit is required. In some cases where both Morse's and Bain's telegraphs are used by an amalgamated company in the same office, it is found convenient, in certain conditions of the atmosphere, to remove the wires from Morse's instruments and connect them with Bain's, on which it is practicable to operate when communication by Morse's system is interrupted.

Extract from the *Encyclopædia Britannica*, p. 179:—

"Another excellent invention of Mr. Bain's. A plan for transmitting apparatus is included in the patent (1846) in which he first specifies his electro-chemical recorder. It is described and commented on in the following terms by Highton:—

"'Another plan consisted in cutting out slits of different lengths in a long strip of paper at the transmitting station and allowing this perforated strip to pass uniformly over a metal cylinder with a pin or spring pressing on the top of the paper. Whenever, therefore, a hole in the paper passed under the pin the pin came into metallic contact with the cylinder underneath, and allowed a current of electricity to pass through the line-wire. All the holes in the paper and their length were therefore proportionately represented at the distant station by chemical marks of corresponding lengths on the prepared paper at that station. This form of telegraph is the quickest at present invented. It does not, however, seem suited to ordinary communications, but only to the transmission of *very long* documents on extraordinary occasions.'

"If one person only is employed to punch holes in the paper, it is evident that, instead of making a hole in the paper, a current of electricity might as readily be sent, and a chemical mark made at the distant station, and thus the message might actually be sent in the same time as that required for cutting the paper. But this remark applies only to the case where there is but one attendant for a wire. If a number of men be employed at each station, then, by dividing the message into parts, and each man punching out his part, the whole paper can be perforated in less time than one man could send the message. On uniting this perforated paper, and applying it to a machine, and on turning the cylinder round, corresponding chemical marks may be made at a distant station with very great rapidity.

"Mr. Highton proceeds to remark, 'The commercial question is, therefore, where ordinary communications are alone required, one of large working expenses *versus* a rather large outlay of capital in the first instance.' With this we cannot agree. It appears clear that the working expenses in carrying out Bain's plans, if the mechanical and electrical success were complete, must be less than would be required to do the same amount of work by hand through several wires, since only the same number of men will be required (the punching instrument being, it is presumed, workable at the same rate as a hand-transmitting key), and the expense of maintaining the extra wires and battery power would be saved. The fact that this plan has not come into universal use on all

lines where there is more work to be done than can be got through one wire by one hand, does not find its correct explanation in Mr. Highton's remarks. It seems more probable that some mechanical or electric imperfections, which may be remediable, have hitherto operated against the complete success of this admirable invention; and we are disposed to conclude that perseverance in attempts to improve its details would be rewarded by the achievement of a vast extension of the work done through the electric telegraph by land."

THE CATTLE PLAGUE IN THE LAST CENTURY.

The following is a reprint of the article* on this subject referred to in the chairman's address at the opening of this session :—

(Continued from Page 127.)

Bleeding has been practised by most who have attempted to cure the murrain. Many have done it promiscuously, in every period of the disease, others have confined it to the first stage only. Whoever considers the effects of bleeding on the habit and the nature of the distemper, as deduced from the symptoms, cannot doubt but that this evacuation must have largely contributed to augment the extraordinary number of those beasts which have died when subjected to medicinal treatment compared to that of those which have been left to the favour of nature. The failure of that degree of animal strength in some beasts which is found in others is, as we evidently see from the facts above-mentioned, not only the cause why one part of the cattle takes the infection while another escapes it, but also, why it proves mortal to one part of those seized with it while the other recovers. Now, it must be allowed that bleeding, when to such degree as to have any effect, more than almost any other means, diminishes the animal strength, or the force of circulation. Must it not then, in proportion, conduce to bring the strong cattle to that state of weakness which is the cause, as we have seen above, why the disease prevails over nature in some more than others, and to render still more weak those which were so?

It is not to be wondered at, nevertheless, that physicians who have hastily considered the murrain as an inflammatory disease† should adopt this most effectual means of resisting inflammation, but there is not the least ground for this notion of the nature of the disease.

In the first stage the contrary of general inflammation appears, for then the symptoms exhibit signs of languor and a disposition to insensibility. Nor is there any general inflammation seen in the whole course of the disease, except when deposits of the morbid matter are made in the last stage, which, if they prove eruptions or tumours in the external parts, are a salutary crisis that should not, on any account, be disturbed or checked, or, if they fall on the internal parts, are a fatal symptom not to be resisted, and are then, moreover, attended with such a state of weakness in the beast that any considerable evacuation must soon be followed with a mortal sinking. At what time, therefore, is the bleeding to be practised with a view to the relieving against the inflammation? In the first stage, when there is a total absence of any such inflammation and the whole danger of mischief lies in that of the want of sufficient strength, or in the last stage, when there is such a state of weakness that the evacuation must necessarily kill the beast; or such a critical eruption as, if suffered to take its course, may save the animal, but if checked or thrown in by the diminution of the fever, which supports it, must attack the internal parts and either cause instant suffocation or convulsions, or, in a short time, a mortification of those parts?* In every light, this evacuation appears to be injurious in the murrain. For, if there can be a case supposed where it might tend to relieve against a particular symptom, which is only when some internal part is inflamed by the deposit of the matter, yet such case would be desperate, and the evacuation would, in other respects, promote those effects that lead to fatal consequences. Bleeding for prevention of the infection, though not enumerated in the preceding view of the means used for that end, has yet been recommended by some physicians, and frequently practised. But, on the same principle, of exposing the beasts to the force of the disease by weakening them, it is of the same bad tendency as when used for the cure. Indeed, it does not in this case so generally do harm. For when it happens not to be performed nearly at the time of the beast's taking the infection, the cattle, except those which are naturally weak, recover their strength again, and the evacuation has, therefore, no consequence with regard to the distemper.

Purging has been frequently tried as a remedy against the murrain, in all the periods of the disease. There is

* The paper is entitled "Observations on the Murrain or Pestilential Disease of Neat Cattle: the Means of Preventing the Infection, and the Medicinal Treatment of the Beasts when seized with it," and is by Mr. Robert Dossie. It is extracted from his "Memoirs of Agriculture," Vol. ii., 1771.—ED. J.S.A.

† The notion that the murrain is an inflammatory disease has arisen from the hasty conclusion of physicians of its being similar and having a great affinity to the small-pox and plague. But it will be manifest, from moderate observations on the respective symptoms of them, that there is no such similarity or affinity betwixt them in nature. The small-pox always produces general inflammation and consequently signs of a strong fever in a greater or less degree in the first stage, and the excess of that inflammation is frequently the cause of its proving mortal. The same is seen in the plague, which begins with symptoms of strong fever and inflammation. Whence they may both be properly deemed inflammatory disorders, as inflammation is one principal secondary cause of the dangerous symptoms and mortality attending them. But in the murrain no such inflammation ever appears in the first stage, but the very contrary, nor does any great degree of heat occur till either towards the middle of the second stage, and then only in the case of a disposition to eruptions, when, as Dr. Layard has justly remarked, it is a prognostic of a recovery, or at the end of the second stage, when deposits of the morbid matter are made on the viscera and soon induce a mortification. In the small-pox an eruption is the sole salutary crisis which nature has instituted, and through which the subject can be saved. It is therefore, together with the preceding and attending inflammation and fever, essential to the disease. But, on the contrary, in the murrain, though eruptions are one mode of the crisis of the disease, or, in other words, one way by which nature discharges the morbid matter when of due maturity, yet they are often wholly wanting, even when the beasts recover, and, therefore, not essential to the disease, even where it has its full natural progress. For in the United Provinces, and other moist and low countries, eruptions are most frequently not found in the beasts which do well, but a diarrhœa, or looseness, constitutes the critical discharge, and, in such case, no great degree of heat arises in the whole course of the disease. This proves an entire diversity in the nature of the diseases to be betwixt the small-pox and the murrain, and evinces that the indications of cure which are adopted from a supposed analogy of them stand on a very erroneous foundation.

* Dr. Layard, who, on the whole, has written the most sensibly on this disease, says, "Bleeding, therefore, will be found necessary only when the inflammation is so considerable and the fever so high that nature is obstructed and cannot expel the morbid matter, and, whenever such symptoms are apprehended, prudence will require bleeding to prevent this coming on, according to the constitution, strength, or age of the beast." But I must dissent from the doctor as to his opinion that there are any cases which admit of a rule to be laid down for bleeding the cattle in the murrain. That *inflammation* does ever *obstruct nature so that she cannot expel the morbid matter* is a mere hypothesis, and, perhaps, might easily be shown to be such as it is not consistent with the known principles of physiology; I shall, however, waive any discussion of that kind here. It is sufficient to deny that any such inflammation is found in the course of this disease, as no

evidently the same objection to it as has made above to bleeding, since it undoubtedly conduces to weaken and exhaust the beast, and, consequently, to render nature less able to resist the force of the contagion. It is also from other reasons improper in this disease by whichever of the two courses, a diarrhœa or eruptions, nature seeks to produce a critical discharge of the morbid matter. Where there is a tendency to eruptions, as for the most part is found in England, this evacuation would necessarily make a derivation and endanger the stopping its progress; and, indeed, not only with us but in Italy, according to Lancisi, "A looseness is an unfavourable symptom and denotes the weakness of the subject." In Holland it is frequent and the cattle do recover with it. But where there is a disposition to it, or it is already begun, medicines which promote the same evacuation are certainly not proper, as they either bring it on before the due time or increase it, if already come on, to a degree that is beyond what the strength of the beast can bear. This, though not, perhaps, in every instance, must yet be the case in the greatest part. The most judicious observers agree, moreover, in condemning the use of purges in this disease, from an actual experience of their bad effects, and the adopting it has been certainly one source of the ill success which has resulted in the attempts made to cure the murrain.

Blisters have been also tried in this disease, but not in so extensive a manner as to afford the means of determining how far they may be of any avail in it. By the apparent tendency to a paralytic state, which is shown in the first period of the murrain, there is room to conclude that such a stimulus might come within the intention of cure. But whether it would be adequate to the indications or trivial in its effects can only be known from a large basis of observations. At all adventures, the difficulty attending the application of blisters to the diseased cattle by such persons as must have the treatment of them in general, renders their use a very unfit means of relief in the murrain.

Rowels, setons, pegging, and caustics have been in their turn vainly employed in the murrain. It must be admitted nevertheless that nature sometimes throws the morbid matter on a part already diseased by a wound so made, and in that case renders it the means of a critical discharge, as we see happen in other contagions. But this will rarely be the case, and where it may there is always a sufficient degree of strength to produce an eruption, which would answer the same end. In any other circumstances the discharge from these drains can be of no service towards the cure of the murrain. For they must know very little of physiology and the history of diseases who imagine a purulent discharge can be of any consequence in them, unless at the due period it be converted into a critical one by a deposit of the morbid matter on the part. In all other views this kind of evacuation rather impedes than promotes the cure of the murrain, as it tends to weaken and exhaust the subject, and consequently to promote the prevalence of the contagion over nature.

Mundification, performed by extraordinary cleansings and rubbing the skin of the beasts, has had great stress laid upon it by some who have undertaken the cure of the murrain. But it is admitted by Professor Camper and others, who have seen it much practised, to be of no avail. Indeed, the effects must be too minute to have any material consequence in a disease of so violent a nature, and if such laborious and constant cleansings, rubbings, &c., as are recommended were serviceable, the performing them would be impracticable where there are a great number of cattle infected without more trouble or expense than the chance of benefit from them would countervail.

The inefficiency of the above-enumerated various supposed remedies for the murrain are less to be regretted, because a great part of them would be attended with such expense and trouble as would render the general use inexpedient. And indeed the same may be said of all of them according to the manner they have been prescribed by those who have recommended them, in which several always, and for the most part many of them, have been combined together. Whatever method of cure is proposed to be actually serviceable in this disease it must be practicable with a moderate share of expense and trouble, or it will never be put in practice by the proprietors of cattle so generally as to save a sufficient number of them to be of any moment to the public. Very little regard has nevertheless been had to this consideration by the physicians who have taken in hand the discovering means of relief against the murrain. They seem only to have sought after what might be efficacious in nature, and directed the use of what they thought so without calculating in the least whether the consequence of its use could be lucratively of any benefit to the private persons who might adopt it, or reflecting, that if it were of no benefit to them they would not adopt it, nor the public therefore reap any advantage from it. Even the most able of those who have been engaged in this pursuit have seemed to forget wholly this circumstance which is indispensably requisite to the forming an effectual plan for the saving any material number of the cattle, as it would be more profitable to abandon them to

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strong signs of any appear but the shivering and heat in the earlier part of the second stage, which denote an eruption, and are, as above-mentioned, enumerated by the doctor himself among the prognostics of recovery, or the violent fever, which follows the attack of the disease on the viscera in the very last period, and is, consequently, always a fatal symptom. But admitting there were cases when it might be beneficial to bleed the beasts in this distemper, with a view to prevent the coming on of too much inflammation, or the consequences of it when subsisting, how are they to be certainly distinguished in practice? Few physicians would agree with each other in settling precise diagnostic marks of this indication. How then are untaught owners of cattle, on whom the task of judging on this matter must depend in the general execution of it, to determine on a point of so complex and nice a nature? On what, according to Doctor Layard's intimation, is to be grounded *the apprehension of the symptoms when prudence will require bleeding to prevent this coming on?* Some answer to that difficulty is, indeed, given in another passage of his essay below, page 65, where he declares, "If a beast be full-grown and fleshy, if a cow big with calf and of such colour as denotes strong fibres, then take away two quarts of blood from the neck. From a strong yearling calf, one quart: and so on in proportion to age and strength, but neither weakly nor poor thin cows, especially white ones, are to bled so much, if at all." But in the third chapter, where he treats of the prognostics, he enumerates these circumstances among the marks by which it may be discerned what beasts are least in danger of being attacked by the contagion and suffering violently from it, all which marks are, in fact, the appearance of strength, though he has not directly said so. Now, if strength be the preservative from the contagion and its effects, what is the consequence of bleeding those which bear such marks but, in fact, reducing them to the same state with the others which want this strength, or, in other words, rendering them equally unable to resist the effects of the contagion? Is not this setting up of art founded on vague principles for the sake of accommodating practice to the notions and hypotheses of darling writers, in opposition to the clear dictates of reason suggested by observation on facts. In chapter the eighth, speaking of the means to prevent infection, he is led round again to truth by the force of such observation. For there he very justly acknowledges the real fact that "Bleeding and purging the cattle, so far from being of use, has not prevented the disease, but rather the symptoms have been more violent in some who were bled and purged." The reason is obvious; because, being weakened, the beasts were less able to resist the contagion. But has the bleeding less effect in weakening the subject when performed after the infection has taken place than it had before? Surely it has not. This was delivered candidly from observation on the real phenomena. What we have before quoted was the result of theoretic reasonings founded on presumed principles, and the supposed authority of Sydenham, &c., in points where in reality no just analogy subsisted. Professor Camper wholly disapproves of bleeding in this disease from an extensive observation of its effects.

the effects of the disease than to incur a greater expense in attempting it than is balanced by the value of the chance of saving them.*

The knowledge of these symptoms, which are easily discernable and best distinguish the murrain from other disorders incident to cattle, and of the peculiar appearances that are produced in the inward parts of beasts which die of it, make by far the most important object of the communication of what regards this disease. It is extremely requisite that all owners of cattle should have a moderate acquaintance with these matters, in order they may as soon, and as certainly as possible, be able to inform themselves whenever their cattle appear to be out or order or die in a suspicious manner, whether they be infected with this disease or not. Without such means of judging they may either inadvertently suffer the contagion to spread in their own herds or to those of others, if it happens to be introduced to any of their beasts, or otherwise be led, from a mistake of other distempers for it, to be at great expense and trouble in trying to prevent it when there is no real occasion. It is of equal consequence, both with respect to the public and to themselves, that a certain degree of intelligence of the criterions by which the murrain may be known from other disorders should be possessed by magistrates, constables, parish-officers, and inspectors of cattle, particularly those near sea-ports, that they may, in some measure, be enabled to put the Acts of Parliament and orders of council concerning the disease into execution, as those acts lay a task upon them, should the occasion of their being inforced present itself, of a very nice and complex as well as momentous nature. I shall, therefore, first give an enumeration of those symptoms of cattle diseased with the murrain, and a description of those appearances it causes in the inward parts of the bodies of beasts that die of it, which are so simple and strong that they may be readily perceived and distinguished by any persons however little versed in the observation of diseases or other subjects of medicinal concern. I shall afterwards, for the use of others who may choose to carry their speculations further and attempt the study or cure of the disease, point out those more latent and less perceptible symptoms and effects of it, which require a previous knowledge of physiology to their being properly observed, and which are rather useful for investigating the nature and kind of the disease, and the best method of curative treatment of it, than for distinguishing it, by sensible marks, from other disorders of cattle. I shall proceed also to apply the whole to that purpose of examination, and to explain whatever can be at present collected of the physiological principles of the disease, in order to ascertain thence the best means of prevention of the contagion, and the proper intention of cure to be adopted in the medicinal treatment of such as are already infected.

The first apparent symptoms of the murrain are—a dry cough; a shivering and gnashing of the teeth coming on at considerable distances of time; shaking the ears and hanging down of the head as if from weakness; stretching out of the neck as when there is a difficulty of swallowing; moving often slowly from place to place seemingly in a constant state of uneasiness; decrease of appetite; diminution or, on the fourth day, total loss of milk in cows which are in a milch state, attended with a lankness of the belly and udder;* and sometimes costiveness. During the time these symptoms only appear the cattle will eat, chew the cud, and at some times look brisk and lively; but after the third or fourth days the following symptoms come on gradually but quickly, except in those beasts which have the disease in a very mild and gentle manner:—A constant heaviness and stupidity; a general weakness; a great decline of the appetite and chewing the cud; a frequent trembling of the whole skin, or of particular parts of it, especially about the flank and buttocks; a purging in some, or a discharge from the nose and ears; and a total loss of the milk in milch cows, if it has not come on before.

Where the disease is not slight, the above-specified symptoms are soon succeeded by these others:—A refusal of all food, and ceasing entirely to chew the cud; an increase of purging; the excrement becoming of a very yellow or of a dark green colour, stinking, and, in some cases, coming away of itself from the fundament, which seems continually open and moving; a difficulty and shortness of breathing accompanied with groaning and an extraordinary distention and widening of the nostrils; a scabbiness of the nose and lips; a great swelling of the belly; a restlessness, uneasiness on lying down, and defect of power, through weakness, to stand, whence the legs are extended outwards, as it were, to prop the body; eruptions on various parts of the body, but particularly about the flank and udder; miscarriage in pregnant cows; and, where the beasts are strong, hard tumours, like boils, especially along the back on each side the bone felt under the *panniculus carnosus*, or outward skin, which frequently break and discharge matter very fetid or stinking.

* In calculating the advantage that is to be received from any remedy for the murrain, the expense incurred by the use of it for the number of beasts actually saved must not be considered alone, but that of all those with which it has been used, in order to the saving such number, must be included likewise. In order, therefore, to determine the value of the chance of saving the cattle by any means of remedy comparatively with the cost of such means, it is proper to state the circumstances in this manner:—It appears that at present in Holland somewhat less than half the beasts which take the infection recover without the aid of any medicinal assistance, and in our country where, as we have before observed, the beasts are stronger, we may safely reckon at least that proportion. But as it is impracticable, when the signs of the distemper first appear, to distinguish with any certainty those beasts which would die without aid, it is necessary all those that are seized with the disease should be subjected to the curative treatment. Let us further, in order to bring the whole matter into this point of view, suppose a method proposed that would save one-half of the beasts which would die without the aid of it. It will then result from these premises that, on the whole, to save one beast the expense of the medicinal treatment must be incurred on four, as one-half would recover if they were left to nature, and only one-half of the other is to be saved by the medicinal aid. For a method which could effect that must be justly deemed highly efficacious. In the methods which have been recommended, and particularly that by the latest and best writer on this subject in our own country, the expenses of labour, medicaments, and extraordinary diet would amount in the treatment of each beast to at least one pound five shillings, and, according to some prescriptions, they would rise to double that sum; so that in any of these methods, according to the manner of computing here laid down, the saving each beast would cost at least five pounds, and in some of them ten. This great expense would not only take away all inducements in the view of gain from the owners of the beasts to employ such means for saving them, but the greatest part of such owners would not be able to make the disbursements necessary to it in proportion to their stock of cattle. As the whole must be provided and laid out in a short space of time, and it would therefore be more to their interest to submit to the present loss and recruit their stock by future resources.

* Doctor de Monchy, city physician to Rotterdam, in his "Remarks on the Mortality among the Horned Cattle," mentions a decrease of milk and a lankness of the belly in milch cows, and a drowsiness and cough in young beasts, as sufficient signs to discover this disease in the cattle. But though they may be good reasons for suspicion of it in places where the contagion is already in the neighbourhood, yet they are by no means alone just grounds to determine that cattle so affected are seized with the murrain when there is no likelihood of the infection having been conveyed to them. The decrease or even loss of milk in cows, and the consequential lankness of the belly, are attendant on any considerable feverish disorder, and the drowsiness and cough in young beasts may arise from colds or other epidemic disorders. I have mentioned this because Doctor de Monchy's dissertation has lately been translated into English, and such a passage in it may mislead and occasion false alarms respecting the introduction of the contagion into our country.

These symptoms go on, most of them augmenting, till the turn or crisis of the disease. They then begin to decrease, and some degree of appetite and chewing the cud to return, if the beasts recover. If otherwise, the purging becomes greater, or, if there were none before, begins with violence, and the dung passes off involuntarily, not only the anus but the tail seeming to lose all power of action. The eruptions, if there be any, flatten; or the tumours, like boils, under the skin grow soft; and the strength seeming to be spent, the beast dies suddenly without any other previous signs; or, in some cases is violently convulsed, roars loudly, throws out a large quantity of foam or froth from the mouth, struggles hard, and tosses about the head with great force.

The second stage of the disease is seldom continued longer here than three or four days, reckoning it, as above-mentioned, from the fourth day after the first signs of the infection. So that the general period of the distemper, from the first attack which was perceived to the crisis or turn, according to the course of the distemper as it subsisted here, may be accounted about seven or eight days.*

The time of appearance of the first signs after the infection is received is five or six days, rarely more, unless where the slightness of the disease renders the symptoms so gentle that they do not become perceptible till in an advanced period of it, but this cannot carry it beyond the ninth or tenth day.

It is not to be understood, nevertheless, that in every beast which has the murrain, all the above enumerated appearances will be found. For as different parts are affected in different subjects, the symptoms vary accordingly, particularly in the last stage; and the natural or casual habit of the beast, as to strength, age, and pregnancy, makes likewise a considerable alteration, both as to the kind, and the degree of the effects of the contagion. The symptoms of the first stage, except the costiveness, constantly attend, however, in a greater or less degree; and the greatest part of those of the second stage follow in a more or less violent manner. The discharge from the nose and eyes is very general; and scarcely ever wanting in those beasts which recover. The purging and swelling of the belly are also very frequent; and almost always occur in those beasts which die. The eruptions, and hard swellings like boils, are likewise very common here† in those which recover.

On the whole, therefore, by a due observation of the manner in which beasts seem affected, when several are seized with an unknown disease at nearly the same time and place, it may be determined, on very good grounds, when the contagion has been introduced. The hanging down of the head, and stretching out of the neck, with other signs of weakness, coming on in the first stage; and followed by the insensibility, tremblings, eruptions in the flank and udder, or hard swellings like boils along the back, and breaking out or scabbiness about the nose and lips, in the second stage; may be looked upon as peculiar symptoms which characterise the disease, and leave little room to doubt of its presence where they appear.

In order, nevertheless, to obtain a more positive certainty in any case where there is reason to apprehend, from beasts having died in the manner and with the symptoms above described, that the infection has been brought to any place, it may be further proper to examine the carcases of such beasts by opening them; and if it be as supposed the following appearances, or most of them, will present themselves. This examination must, however, be confined to such as die from the natural course of the distemper; and not extended to such as are killed, or have been subjected to medicinal treatment; because the disease has not then had its due and full effect on the parts; and the state in which they will then be must proportionably fail to answer the description above given.

A very stinking air, and sometimes matter, rushes out on piercing the skin, or making an opening into the cavity of the belly; particularly if there be swellings on the back, and the skin be pricked or cut in that part. The mouth, throat, and gullet are red; and full of small specks, or ulcers, attended with the appearance of what is called the thrush in children. The lungs are red, ulcerated, speckled with blackish spots, and sometimes fraught with small bladders of fluid like water. The liver is swollen, full of dark yellow gall, and rotten, so as scarcely to bear the touch; and the gall-bladder is stretched to a large size by greenish gall. The cud-bag, or paunch, is red, and discoloured with blackish spots, puffed up with air to a very great magnitude, and void of any fluid, but containing a hard mass of cud, which has remained there and is become dry, instead of passing to the other intestines to be digested. The honey-comb, manifold, and curd-bag are in much the same state with the cud-bag, except as to the various degrees of hardness and dryness of the cud in the two first, and that the curd-bag is empty. The smaller guts are spotted with red and black; and the end of the rectum or last gut, for some space above the anus or fundament, is black, rotten, and foul with clotted blood on its surface. The womb is red and enlarged in cows that are not pregnant, but in those with calf it is blackish. The fat, where any can be found, is of a high yellow colour and soft consistence. Collections or gatherings of matter are frequently met with in the cavities of the horns and head. When the greatest part of these appearances present themselves in the respective parts on opening the beasts which have died after the principal of the above symptoms have been observed in them, there can be no room to doubt but that they have had the murrain. Even where any accurate information may be wanting of the nature of their illness there is a very strong ground of conclusion that it was this disease, if, on the examination of the carcases soon after the beasts are dead, the eruptions, particularly the hard boils along the back, the scabbiness on the nose and barbs, the puffing up of the skin or belly with stinking air, the gathering of matter in the horns and head, the dry mass in the cud-bag, the blackness of the womb, and the rottenness of the gut next the fundament, or most of them, are found.

The symptoms and effects of the murrain, which may be deemed, less properly than the foregoing, the subject of the examination of persons not conversant in medicinal subjects, and less apparently the characteristic marks of the disease, but which may yet afford material lights for discovering the true nature and the indications of cure of it, are those which follow.

* In Holland the period of the murrain from the first sensible marks of it to the crisis or turn, is much longer than it appeared to be with us, and is most generally found to be about twelve days. The reason of the variation of the disease in this point betwixt Holland and here lies in the superior strength of our cattle, which enables nature in them to bring the disease to a crisis in so much less time. This greater degree of strength in our cattle manifests itself, as we have remarked elsewhere, in their more frequently throwing out eruptions in this disorder here than in Holland, and in their not being susceptible of the infection, except after very bad seasons, though less injurious epidemic causes render them so in that country.

† Though eruptions were very frequent in the murrain while it prevailed here, yet they are much less common, as has been above intimated, in Holland, and other low and damp countries, where the cattle are habitually weaker. When they do appear there, they are also different, for the most part, from those found in our cattle. For instead of being on the back, and large like other boils, they are generally about the flank and udder; and are less, flatter, and softer. The general crisis of the disease, in such case, is not by eruption, but by diarrhœa or looseness, which was found here, on the contrary, to be mostly a bad symptom. This is not, however, constant. For there are instances of beasts which do well in Holland without a diarrhœa; and there were some here of those which recovered with it. But the crisis, nevertheless, is here by far the most frequently an eruption, either on the back or about the nose and lips; and in those countries a diarrhœa.

In the first stage, heat, but not great, in the head, and particularly at the roots of the horns, attended with a coolness of the body and the extremities; hot and stinking breath; deafness; pulse quicker than in health, the strokes being from sixty to seventy, but irregular, though without stated remissions.

In the second stage, signs of sickness*; breath more hot and stinking; fetid steams from the skin; respiration difficult, particularly expiration laboured and performed with groaning; urine high coloured and turbid, but generally without any deposit of sediment, or any bad smell, and retained longer than in health, though not in the whole much different in quantity; dung acrimonious or sharp to such a degree as to leave a visible irritation for some time after in the anus; blood florid; seeming exacerbations of pain in the evening; a constant disposition to lie, but attended with such uneasiness in some that they stand almost continually, though with great difficulty on account of their weakness; an absence of thirst throughout the whole disorder, though with a willingness to drink in moderation; pulse increasing in quickness, according to the progress of the disease, from seventy to ninety, and having periodical diurnal remissions as in the paroxysms of fevers, but irregular, intermitting, and growing smaller as the velocity becomes greater.

On opening the carcases of beasts dead of the murrain these appearances will occur, together with those before enumerated:—In the brain the blood-vessels are found turgid and very red, and clots of grumous blood, as well as a lymphous fluid, show themselves frequently in the substance. On the membranes of the cavities of the nose, and the whole extent of the frontal finus, the large glands, and the medullary substance of the horns, marks of inflammation and excoriation will be seen. The kidnies and bladder are inflamed and void of urine. The flesh in some beasts is livid, in others of a lively red for a short time after the death of the beasts, but soon changing to a green colour. Appearances are found of emphysema, or vesicles of air, in the lungs, mesentery and cutaneous membranes in various parts of the body.

From the whole of the symptoms and appearances of the murrain we may draw these conclusions as to the nature and effects of the disease:—It is communicated from one beast to another by a contagious matter or virus that, acting as a leven, produces a ferment in the humours of the parts into which it is introduced, and either reduces the nerves of such parts to a paralytic or inactive state, or renders them too irritable and active, at the same time counteracting those natural ferments in such humours which are requisite for the due support of the animal economy. But when, from the strength of the solids giving due motion to the fluids, the natural ferments, are duly powerful, it cannot prevail over them, and therefore has no morbid effect. As we see in those beasts which escape the infection though exposed to the contagion. In those subjects where there is a default of such strength it goes on by the above specified means to weaken the force of the circulation and deprave the secretions, whence also that putrescence or putrid ferment to which all animal substances have a natural tendency, when not superseded by the vital ferments, is at length brought on, and if no critical expulsion be made in due time of the contagious leven by the fever induced by its effects, destroys the vital economy, and necessarily causes the death of the beast. But if, by the inflammation produced, the force of circulation and consequently the power of the vital ferment be so increased as to overcome that of the contagious leven, the morbid matter in which it resides is expelled either in eruptions on the surface or by a discharge from the intestines.

The progress and the manner of the action of the contagious virus in the murrain may, from the symptoms and the appearances in the dead beasts, be deduced to be as follows:—The first effects of the contagion appear principally in the head and the upper parts. It produces a certain degree of nervous weakness or paralytic disorder in those parts, as is shown by the deafness, dulness of the eyes, debility of the neck, and shaking of the head. This disorder affects also gradually the glands which secrete the saliva and lymph of the stomach, as there is found, in a more advanced stage of this disease, a total want of those fluids, the cud forming a dry concreted mass. At the same time, nevertheless, the glands of the nose and eyes are rendered more irritable, and the humours are secreted in them much more copiously than the natural degree. The paralytic disorder of the salival glands, and the glands of the stomachs, extends itself frequently in the first stage to those of the small guts, as may be inferred from the costiveness observed at that time. But this often changes afterwards into a great irritability in the second stage, as is evinced by the profuse diarrhoea attending. On the other hand the irritability of the glands of the nose and eyes seems to be continued to the membranes of the lungs by the cough, which is almost a constant symptom. The stomachs seem also to partake of the paralysis of the upper parts, and this appears to be in proportion to their nearer situation to those parts, as may be inferred from the retention of the cud in the cud-bag and honeycomb, and the emptiness of the cud-bag. There is an early effort of nature to make an expulsion of the morbid matter by the external parts of the head, as may be collected from the signs of topical inflammation which show themselves, and particularly about the horns, where abcesses are afterwards frequently formed. But this alone rarely proves a critical discharge.

After the first four days the contagion diffuses its effects much more generally, and frequently attacks the liver and the lower intestines, which then become very irritable; a great discharge of bile, and the other humours secreted in them, ensuing. But the inactive or paralytic state of the salival glands and those of the stomach yet goes on increasing, till all secretion by them ceases. Hence the appetite and digestion are entirely lost; and the inanition, caused by the want of a du supply of chyle to the blood, conspires greatly, with th nervous debility above specified, to bring on a grea languor of the circulation and other vital action. Thi necessarily induces a putrescence of the juices; whenc new sensible effects are produced, which may be deeme secondary symptoms; being not the immediate cons quences of the action of the contagion, but the effects the putrid ferment suffered to prevail by the suppressi of the animal ferments, which counteracted it whi they subsisted in the due degree. In this difference the cause of the symptoms principally consists the d ference of the first and second stages of the diseas the first exhibiting those alone which result from t action of the contagion on particular parts, and m

* Doctor Layard has mentioned, along with the sickness, the throwing up of bile as one of the symptoms of the murrain. He does not intimate that he has seen it himself, but refers for it, in a note, to Aretæus "De Morbis Acutis." The notion of such a fact was a most palpable error in the first broacher of it, whoever he were; and it is a great inadvertence in the Doctor to adopt it; as he has himself, in more than one part of his treatise, insisted on the impossibility of neat cattle vomiting at all, on account of the formation of their intestines. Professor Camper has, indeed, seemed to contradict this opinion by the relation of a fact. For he declares that giving a decoction of camomile has made the beasts vomit. If that did happen, however, it cannot be supposed to be any other vomiting than the returning the fluid into the mouth from the cud-bag only, by the same action as the cud is brought back thither in order to rumination; which could have no effect towards forcing up bile. Whoever considers that the bile must pass through all the four stomachs in its way from the duodenum to the mouth, must be satisfied that it is next to an impossibility any such thing should happen. It is most rational to believe that if a discharge from the mouth of any thing resembling bile, on a slight inspection, has been observed, it was only of some yellow cud mixed with a large proportion of fluid, and mistaken for bile in default of stricter examination.

therefore, be called primary; the second displaying not only a further extension of such symptoms, but those others also that are caused by the general depravity of the fluids, and the consequential disorder of the vital economy, which arise from the putrescence that prevails from the weak action of the solids in giving due motion to the fluids, and from the defect or perversion of the glandular secretions. In this advanced state of the disease, a final period is soon brought on, either by a salutary crisis or the death of the beast. The morbid matter falling on some particular parts, and the general depravity of the humour causing obstructions in others, topical inflammations and a general irritation follow; whence, necessarily, a fever rises in a greater or less degree. By this means the force of circulation is increased, so that, where the habit is strong, the natural ferments, being again revived by the accelerated motion of the fluids, prevail over that of the leven of the contagion; and the morbid matter is either thrown on the superficial parts, in case of great strength, where it forms eruptions and tumours; or discharged by the glands of the intestines, in case of a less degree of strength. This constitutes a salutary crisis, in consequence of which the beasts recover from the murrain, at least considered as an acute disease; though they sometimes die afterwards of the ulcerations or abscesses produced then by it in the brain, lungs, or other viscera. But if the natural strength be so defective that the irritation and consequential fever cannot produce a sufficient force of circulation to give due power to the vital ferments, the contagious leven and putrescence overcome them; and an excessive evacuation is made by the liver and the glands of the small guts, which exhausts the remains of that power on which animal action depends; while the external and weaker parts suffer a gangrene from the deposit of the morbid matter, and the want of due motion of the vitiated and putrid humours.

(*To be continued.*)

Fine Arts.

THE LUXEMBOURG GALLERY.—The gallery of modern pictures at the Luxembourg has recently been opened, after re-arrangement and cleansing. The new catalogue contains about sixty new entries, including a fine picture by the late animal and landscape painter—Troyon, presented to the nation by the mother of the artist. It is said that a *salle* in the same gallery is to be set apart in future for the works of foreign artists; and also for the pictures of French artists recently deceased, it being the practice to retain such works for five years after the death of the artist, and then to transfer them to the Louvre.

LA FONTAINE ILLUSTRATED BY DORE.—Gustave Doré, the eminent French artist, is about to illustrate La Fontaine's Fables, and a very charming work may be expected, for there is no question that the subject is far better suited to M. Doré's style than such grand themes as the *Inferno* of Dante. His illustrations of the Fairy Tales of Perault, and of the *Contes Drolatiques* of Balzac, may be cited as the most completely satisfactory emanations of his always-clever pencil. M. Doré is said to be at present a constant visitor to the Jardin des Plantes for the purpose of studying the habits and movements of animals. Rats play a grand part in the fables of the amiable La Fontaine, and M. Doré is said to have at home an interesting collection of rats, of all colours and ages, who have become quite tame, and exhibit their antics in the most amusing manner; these creatures will have the honour of acting as models for many of the figures in the fables.

Commerce.

TEA CULTIVATION IN CEYLON.—It appears by the *Colombo Observer* that great progress is now being made in this respect in Ceylon. It is said that the tea lands in the Himalayas alone are quite capable of producing ten times the whole amount of tea imported into England from all the other tea-growing countries in the world. "A considerable quantity of tea seed," says Dr. Thwaites in his official report on the subject, "has been distributed during the past year. The climate of Ceylon seems admirably adapted for the successful cultivation of tea. The plant grows well from the elevation of Peradenia (1,600 feet) to that of Hakgalla (5,000 feet), and it would no doubt thrive in situations somewhat higher than the latter; and, as there are extensive tracts of forest land in the island, too high for coffee but quite suitable for tea, it may reasonably be anticipated that the cultivation of the latter will at some future time assume large proportions. In view of such a contingency, and in order to secure the production of a larger quantity of seed than is at present procurable in the island, an addition is being made to the number of tea-plants now growing in this garden (Peradenia); a certain number have been planted out at Hakgalla; and several planters are, at my suggestion, forming small nurseries of tea upon their estates. When sowing tea seeds, it is of importance to know that, to ensure success, they should be perfectly fresh; for they will not germinate if they have been allowed to become dry."

Colonies.

NEW SOUTH WALES.—The estimates for the year 1866 have been laid before the Assembly. The total amount required for the year chargeable on revenue is £1,876,520, being an increase of £52,280 on the appropriation for last year. The increase is, however, principally due to the interest on debentures and Treasury bills exceeding that of the previous year, and the expenditure for the several departments is to be decreased by £41,766. There is also a supplementary estimate for 1865 of nearly £10,000. The estimates contain the following sums under the head of railways. Towards the extension of the Great Western line, £200,000; towards the extension of the Great Northern line, £400,000; towards relaying the line from Sydney to Parramatta Junction, £20,000; and for enlarging railway bridges at East Maitland. £4,000.

GOLD.—The total amount of gold exported from South Australia since the beginning of 1865 is 1,499,368 ounces, of which 142,540 were transhipped from New Zealand. During the corresponding period of the previous year the entire quantity was 1,581,731 ozs., and of this total 201,122 ozs. were from New Zealand. The imports of specie during October amounted to £125,000, in gold £300. The specie exported amounted to £34,296. The quantity of silver bullion exported was 2,476 ozs. 10 dwts.

Notes.

THE STATE OF THE STREETS OF LONDON.—At a meeting of the Commissioners of Sewers of the City on Tuesday, the 16th inst., among the business that was to be transacted was the hearing of summonses that had been taken out by the inspectors of the commissioners against the contractors for cleansing the streets of the City, for having neglected their duty in that respect on the occasion of the great snow storm on the 11th of January. The wretched state of the streets was fully established, not only by the evidence of the inspectors, but by the testimony of many of the commissioners themselves, and it was proved in several cases that there had been no endeavour made to remove the mass of snow and filth that had accumulated. The defence was that the storm had come on so suddenly that the contractors

were unable to obtain men to do what was required, but the commissioners considered there had been a neglect of duty, for which they imposed a fine of £2 in the case of every street where that neglect had occurred. The total amount of the fines thus levied was £200.

A Silent Poker.—In the last number of the *Journal* a "silent coal-scuttle" was recommended for invalids; the fireplace will be complete if a common walking-stick or soft bar of wood be used as a poker—it makes very little noise, either when used or when laid down. In many sick chambers the advantage of this poker has been fully appreciated, and this simple article of comfort to invalids cannot be too widely made known.

Public Register of Apartments to Let.—The municipality of Paris has established registers of lodgings to let at each of the twenty mairies, or offices of the mayors, in the city. The register is an immense volume, placed on a stand in the vestibule of the building, and the entries are under the heads of the twenty arrondisements. The idea is an excellent one, the only doubt is whether it will be the special business of anyone to see that as soon as any apartment is let, it shall be erased from the register, otherwise in a very short time the mass of entries will not only become enormous, but deceptive. If the owners of apartments attend to their own interests, they will aid in perfecting so useful a public register.

The Paris Academy of Sciences has just received a handsome bequest by the will of a gentleman named Plumet, who has bequeathed twenty-five shares in the Bank of France, each worth about one hundred and fifty pounds, to establish a certain number of annual prizes.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, 8½. 1. Mr. James Martin, "Explorations in N.W. Australia." 2. Mr. James Jardine, "Description of Cape York District, Australia."
Entomological, 7. Annual Meeting.
Society of Arts, 8. Cantor Lecture. Mr. G. W. Hastings, "On Limited Liability." (Lecture IV.)
Medical, 8½. Lettsomian Lecture. Dr. Anstie.

Tues.....Medical and Chirurgical, 8½.
Civil Engineers, 8. Continued Discussion upon Mr. Grant's Paper, "On the Strength of Cement;" and (time permitting) Mr. W. H. Mills, "On the Craigellachie Viaduct."
Zoological, 8½.
Ethnological, 8. 1. Sir E. W. Belcher, "Remarks on the Andaman Islands, from the Notes of Lieut. St. John." 2. Dr. Caddy, "Visit to the Patagonians."
Royal Inst., 3. Professor Tyndall, "On Heat."

Wed.....Society of Arts, 8. Lord Henry G. Lennox, M.P., "On the Uses of National Museums to Local Institutions."
Geological, 8. 1. Mr. R. A. C. Godwin-Austen, "Notes on Belgian Geology." 2. Mr. W. T. Locke Travers, "On the Origin of certain Lake-basins in New Zealand." Communicated by Sir C. Lyell, Bart.
R. Society of Literature, 8½.
Archæological Assoc., 8½.

Thurs...Royal, 8½.
Antiquaries, 8½.
Philosophical Club, 6.
Royal Inst., 3. Prof. Tyndall, "On Heat."

Fri.......Royal Inst., 8. Mr. S. W. Baker, "On the Sources of the Nile."

Sat ......Royal Inst., 3. Prof. Westmacott, R.A., "On Art Education, and how Works of Art should be viewed."

Patents.

From Commissioners of Patents' Journal, January 12th.

Grants of Provisional Protection.

Air in rooms, cooling and purifying—3292—W. Clark.
Astronomical instruments—3316—W. E. Newton.
Bolts and rivets—3215—A. V. Newton.
Boot and shoe soles of leather, cutting and rounding—2916—N.H.Felt.
Boots and shoes—3371—J. Hall.
Bottles, stoppers for—3—N. Thompson.
Carriages, axles for—3336—E., J. C., and J. Lones, J. and T. Brettell, and C. Vernon.
Charged cartridge cases, closing—3379—G. Hawksley.
Chromates of ammonia and chromic acid, making—2702—W. Clark.
Coats, &c.—3157—W. Calvert and J. S. Robertson.
Copper, smelting—3267—H. C. Ensell.
Cotton bale tie or hoop lock—3361—W. E. Newton.
Cotton, &c., compressing—2837—J. J. McComb.
Dyeing fabrics, preparing dyes, and making yarns—3318—J.A.Cooper.
Fabrics passing through machinery, expanding—3375—W. Edleston and J. Schofield.
Fire-arms, cartridges for breech-loading—3304—W. E. Newton.
Fire-arms, repeating—3284—W. Clark.
Fire places for economically consuming fuel—25—B. Blackburn.
Fire-proof safes—3305—J. W. Blackman.
Furnaces—5—T. Prideaux.
Gas-burner—3303—G. Davies.
Gas, regulating heat obtained by—3268—H. Planck.
Grain, &c., treating—3344—G. C. A. D'Auxy.
Ivory and wood, compositions in imitation of—3310—M. D. Rosenthal and S. Gradenwitz.
Kamptulicon—11—C. Tayler, W. Dyer and H. and J. Dooley.
Labels, &c., damping and gumming—3343—J.Benn & G.O.Luckman.
Machinery, lubrication of—3342—J. Rea.
Materials, conveying of—21—W. Simons.
Peat, purifying oils produced from—3312—D. McGrath.
Piston and grease cup—3353—J. Bates, E. and E. W. Brookes.
Pumps—3330—H. D. Hoskold and W. B. Brain.
Railways, steel crossings for—3332—F. W. Webb.
Railway trains, signalling between passengers, guards, and engine drivers of—3176—R. Pickup and J. Heald.
Rudders—3367—J. R. Napier and W. J. M. Rankine.
Safes—3324—J. Groves and G. Robinson.
Ships, steering—7—J. Ashdown.
Shoeing horses with metal shoes without nails—3134—J. Sainty.
Signals—3381—J. S. Gisborne.
Soda—3340—M. Henry.
Stays, &c., and fastenings for same—3072—S. Dixon.
Steam boilers or generators—3369—A. Barclay.
Steam boilers, &c.—3338—J. Fisher.
Steam engines—3308—W. Clark.
Steering apparatus—3171—S. Clark.
Steps or stairs, treads of—3306—G. Hawksley.
Stereoscopes—3363—I. Baggs.
Strapping used in machinery, securing ends of—3302—W. Barnsley.
Suphurous and arsenical pyrites, treatment of—3256—C. Pengilly.
Telegraph cables, paying out and hauling in—3346—S. Griffith.
Telegraphic cables and conductors—3357—C. F. Varley.
Telegraphic inking and marking instruments—3008—C.H.Chadburn.
Textile fabrics, finishing—9—W. H. Norrie.
Textile matters, applying mineral soda to the scouring of—3167—L. J. Bouchart.
Throstle machines and flys—3377—T. Parkinson.
Trimmings—3320—W. Smith.
Vehicles and ships, propelling—2493—D. Spink.
Vessels, side propellers for—3373—B. Burchall.
Watches, winding keyless—3230—A. Guye.
Weaving, looms for—3365—J. J. and E. Harrison.
Window sashes, hanging—3326—R. M. Marygold and S. Fitzjohn.

Inventions with Complete Specifications Filed.

Carpets, &c., fabrics for—72—H. Hutchinson.
Hides or skins, tanning—33—W. H. Towers.
Wool, detergent for cleansing—65—J. H. Johnson.

Patents Sealed.

1857. R. V. Tuson.	1919. J. McG. Croft.
1865. J. Thornton.	2031. A. V. Newton.
1867. J. Armitage.	2081. P. C. Kjellberg.
1871. W. A. Richards.	2440. G. E. and E. L. Rolland.
1874. J. E. F. Ludeke.	2463. C. M. Kernot & N. Symons.
1882. D. Caddick.	2585. H. A. Bonneville.
1887. T. H. Ince.	2727. J. W. Lea.
1889. W. Tranter.	2942. L. A. Velu, and F. E. and L. E. A. Fosse.
1893. R. C. Bristol.	
1896. A. V. Newton.	

From Commissioners of Patents Journal, January 16th.

Patents Sealed.

1888. C. Rosson.	1937. J. Bélicard, jun.
1891. H. A. Clum.	1963. B. Latham & R. Campbell.
1894. W. la Penotière.	1974. A. Y. Rehm.
1895. R. Smyth and W. E. Evans.	2016. W. H. Preece.
1899. St. J. V. Day.	2068. J.W. Sumner & C. A. Scott.
1903. R. M. Wanzer.	2079. W. E. Newton.
1904. A. Smith.	2149. W. E. Newton.
1905. J. H. Chaudet.	2178. W. E. Newton.
1914. J. P. Gillard.	2186. G. Owen.
1915. M. P. W. Boulton.	2757. A. Krupp.

Patents on which the Stamp Duty of £50 has been Paid.

157. E. Sabel.	118. J. S. Butler.
120. G. A. Biddell.	123. E. Morewood.
176. S. Blackwell.	145. L. Verdure.
217. W. Allen and W. Johnson.	151. J. Lightfoot.
256. W. Clark.	347. C. Parigot and A. Grivel.

Patents on which the Stamp Duty of £100 has been Paid.

147. W. Newman.	113. J. J. Stevens.
133. W. Betts.	114. F. J. Manceaux and E. Vieillard.
153. R. Garrett, jun., and J. Kerridge.	126. J. Dauglish.
95. J. Gibbons.	124. W. Craft and T. Wilson.

Journal of the Society of Arts.

FRIDAY, JANUARY 26, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

January 31.—"Dwellings for the People; how to Multiply and how to Improve them." By Thomas Beggs, Esq.

February 7.—Renewed Discussion on the Paper read by Mr. W. Hawes (Nov. 29, 1865), "On the Proposal that the Railways should be Purchased by the Government."

Cantor Lectures.

The following is the syllabus of the course of lectures "On Submarine Telegraphy," to be delivered by Fleeming Jenkin, Esq., F.R.S.:—

Lecture I.—Monday, January 29.

The Insulated Conductor and its Properties.

1. *Terms used*:—Conductor, insulator, battery, earth, circuit, current.

2. *Component parts* of common submarine cable; copper strand; gutta-percha insulator; iron protection.

3. *Conductor*.—(*a*.) Mechanical properties of copper strand and wire; jointing. (*b*.) General electrical properties of simple copper wire; strands; segmental strand; Allan's conductor. (*c*.) Chemical properties of copper strand; platinum wire proposed by C. F. Varley.

4. *Insulator*.—(*a*.) Gutta-percha and Chatterton's compound. (*b*.) Mechanical properties; jointing. (*c*.) India-rubber; solvents, heat and pressure; vulcanised india-rubber; jointing. (*d*.) Chemical properties and permanency. (*e*.) General electrical properties. (*f*.) Absorption of water. (*g*.) New insulators:—Collodion; Parkesine; Balata.

5. *Mechanical properties* of completed core; Effect of stretching; knotting; bruising.

6. *Weights and dimensions* of materials in existing cables.

Lecture II.—Monday, February 5.

Shallow and Deep Sea Cables.

1. *Serving and Worming*.—Hemp or jute; tarred or tanned; several conductors in one cable.

2. *Iron sheathing*, common helical (spiral) form.—(*a*.) Extension. (*b*.) Kinking. (*c*.) Untwisting. (*d*.) Protection against rough usage. (*e*.) Strength.

3. *Iron and steel wire*.—Qualities used, welding, splicing.

4. *Sheathing machines* do not twist the wire.

5. *Permanency of wire*.—Rust, friction, galvanizing, Bright and Clark's bituminous covering.

6. *Statistics*.—Lengths; weights and duration of cables. Interruptions, total losses.

7. *Maintenance*.—Cost of repairs; returns on capital expended.

8. *Deep-sea cables*.—Depths on various lines. Modifications of common form. 1st Atlantic cable, 2nd Atlantic cable.

9. *Proposed forms* of deep-sea cables. Hempen rope, or Rowett's cable, Allan's cable, Duncan's plaited ratan cable, Rodger's, or Wells and Hall's plaited hemp cable, bare gutta percha.

10. *Statistics* of deep-sea cables.

Lecture III.—Monday, February 12.

Laying and Repairing Cables.

1. *Stowage* on board ship. Water-tanks. Cones and rings.

2. *Break*.—Object, simplest form. Appold's break. Dynamometer.

3. *Theory of Submersion*.—Reference to paper by Messrs. Brook and Longridge. (*a*.) Ship at rest, cable at rest, common catenary (*b*.) Ship at rest, cable in motion. (*c*.) Case of spheres dropped at regular intervals from ship in motion. (*d*.) Motion of an inclined rod in water. (*e*.) Cable paid out from ship in motion without tension at bottom lies in a straight line from the surface of the water to the bottom. (*f*.) Tension on cable when laid taut and slack. (*g*.) Effect of light specific gravity in diminishing tension when cables are laid slack. (*h*.) Angle of inclination and line of motion of cable through water.

4. *Application of Theory* to common iron or steel covered cables; to the second Atlantic Cable, and to a bare gutta percha core.

5. *Proposed improvements*.—Reels, buoys, floats, nippers, elastic arrangements to compensate for rise and fall of ship.

6. *Repairs* in shallow water; grappling or dredging; underrunning; picking up machinery at bows and stern; depths from which cables are commonly recovered.

7. *Repair of deep Sea Cables*.—Proposed methods of recovering second Atlantic Cable; strains on cable when lifted; chance of success.

Lecture IV. Monday, February 19.

Electrical Tests.

1. *Terms used*.—Electrical resistance, Ohm's law, resistance of battery, units of resistance, resistance coils, galvanometers, Thomson's galvanometers.

2. *Tests of conductor*.—(*a*.) Meaning of "good conductor," object of having a good electrical conductor. (*b*.) Method of measuring resistance, Wheatstone's differential measurer. (*c*.) Specific resistance of pure metals in B.A. units; annealing. (*d*.) Effect of temperature; specific resistance of pure copper at various temperatures. (*e*.) Effect of impurities; quality supplied for various submarine cables. (*f*.) Specific resistance of German silver and some other alloys and their uses. (*g*.) Use of resistance test to determine temperatures. (*h*.) Continuity test.

3. *Tests of Insulator*.—(*a*.) Meaning of the words, "good insulator," object of having a good insulator. (*b*.) Test of leakage. (*c*.) Resistance to conductor across the insulator from the copper inside to the water outside, and method of determining the resistance. (*d*.) Effect of continued electrification. (*e*.) Effect of temperature on insulators. (*f*.) Resistance per knot of various insulators in cables actually manufactured. (*g*.) Specific resistance of various insulators at various temperatures in terms of B.A. units. (*h*.) Effect of pressure on insulation of gutta percha and india rubber. (*i*.) Effect of the absorption of water on the same materials.

4. *Tests at sea*.—Object of tests. Thomson's marine galvanometer; effect of rolling of ships; of earth currents; system recommended.

Lecture V.—Monday, February 26.

Electrical Tests.—(*Continued*.)

1. *Testing short lengths*; use of statical electricity. Thomson's Electrometers.

2. *Testing joints*.—Bright and Clark's test by accumulation; testing from outside with battery; test from outside by electrometer.

3. *Induction tests*.—(*a*.) Meaning of "charge," "capacity," and "inductive capacity." (*b*.) Object of diminishing the capacity of a cable. (*c*.) Methods of measuring the capacity of a cable. (*d*.) Capacity per knot of various cables. (*e*.) Specific inductive capacity of various materials; effects of temperature and pressure.

4. *Tests to detect faults*.—(*a*.) Fault of continuity with copper, bare or insulated. (*b*.) Defective insulation.

5. *Tests to determine the position of faults*.—(*a*.) Insulated fault of continuity. (*b*.) Dead earth. (*c*.) Partial loss of insulation in a cable with one conductor; resistance of fault; polarization; earth currents. (*d*.) Par-

tial loss of insulation in a cable with two or more conductors.

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing ONE Friend to each Lecture.

Tickets for this course, for friends of Members, are issued with this week's *Journal.*

Art-Workmanship.

The following is a list of the Prizes awarded. The judges were, Richard Redgrave, Esq., R.A., M. Digby Wyatt, Esq., and Alfred Morrison, Esq.:—

FIRST DIVISION.

WORKS EXECUTED FROM PRESCRIBED DESIGNS.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—Work executed in marble or stone, after the Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.*—Three works sent in.—First prize not awarded. Two second prizes of £7 10s. each, one to Alexander Kenmure, 43, Pancras-square, N.W.; and one to R. Wallace Martin, 5, Olney-street, Walworth, S.

(*b.*) *Ornament.*—Work executed in marble, stone, or wood after a carved chair-back in the South Kensington Museum.—Two works sent in.—First prize not awarded. Second prize of £5 to John Dayman, jun., 4, Edward-street, Vauxhall-bridge-road, S.; and extra prize of £2 10s. to James Stuart, 7, Pancras-square, N.W.

(*c.*) *Ornament.*—Work executed in stone, after a *Gothic bracket* in the Architectural Museum.—One work sent in.—No prize awarded.

(*d.*) Work carved in wood after a design by *Holbein.*—No works sent in.

(*e.*) Work carved in wood after the *Head of a Harp* of the period of Louis XVI.—No works sent in.

(*f.*) *Ornament.*—Work carved in wood after an *Italian picture frame.*—No works sent in.

Class 2.—Repoussé Work in any Metal.

(*a.*) *The Human Figure as a bas-relief;* after *Raphael's "Three Graces."*—Five works sent in.—No prizes awarded.

(*b.*) *Ornament.*—Work executed after a Tazza in the South Kensington Museum.—One work sent in.—First prize of £5 to S. Beresford, 29, Myddelton-street, E.C., and £3 extra.

Class 3.—Hammered Work in Iron, Brass, or Copper.

Ornament.—Work executed after a portion of the Pediment of a Gate (German work, date about 1700), in the South Kensington Museum.—Three works sent in.—First prize of £7 10s. to W. Letheren, Lansdown Iron Works, Cheltenham; and second prize of £5 to T. Winstanley, 7, Stanhope-street, Newcastle-street, Strand, W.C.

Class 4.—Carving in Ivory.

(*a.*) *Human Figure in the round.*—Work executed after a miniature statuette (Italian), No. 304 in the South Kensington Museum.—Two works sent in.—First and second prizes not awarded. A prize of £5 to John Bentley, 22, Sherwood-street, Golden-square, W.

Class 5.—Chasing in Bronze.

(*a.*) *The Human Figure.*—After a reduced copy of "*Clytie.*"—No work sent in.

(*b.*) *Ornament.*—Work executed after *Goutier*, from a cabinet in the possession of Her Majesty the Queen.—Four works sent in.—First prize not awarded. Two second prizes of £7 10s. each awarded, one to G. R. Meek, 26, Harrison-street, Gray's-inn-road, W.C.; and one to H. J. Hatfield, 16, Alfred-street, Tottenham-court-road, W.C.

Class 6.—Etching and Engraving on Metal.—Niello Work.

Ornament.—Work executed after arabesques by Lucas Van Leyden, 1528.—One work sent in.—First Prize not awarded. Second Prize of £5 to G. S. Berry, 4, King-street, Regent-street, W.

Class 7.—Enamel Painting on Copper or Gold.

(*a.*) *The Human Figure.*—After *Raphael's design of the "Three Graces,"* executed in *grisaille.*—Two works sent in.—First prize not awarded. Second prize of £5 to W. J. W. Nunn, 10, Gardham-street, Bromehead-street, Commercial-road, E. Extra prize of £3 to E. Autran, 4, Nassau-street, Soho-square, W.

(*b.*) *Ornament.*—Executed after a German arabesque (16th century).—One work sent in.—First prize of £5 to Frederick Lowe, 13, Wilderness-row, E.C.

Class 8.—Painting on Porcelain.

(*a.*) *The Human Figure.* — After *Raphael's* "*Two Children,*" in the cartoon of "*Lystra.*"—Three works sent in.—No prizes awarded.

(*b.*) *Ornament.*—Executed after arabesques by Lucas Van Leyden, 1528.—One work sent in.—First prize of £5 to Alexander Fisher, 5, Clyde-street, Stoke-upon-Trent.

Class 9.—Decorative Painting.

(*b.*) After an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum.—Three works sent in.—First prize not awarded. Two second prizes of £3 each awarded, one to John Henk, George-street, Stoke-upon-Trent; and one to Thomas Longmore, Hardinge-street, Fenton, Staffordshire.

(*b.*) *Ornament.*—Executed after a *picture frame*, in the South Kensington Museum.—No works sent in.

Class 10.—Inlays in Wood (Marquetry or Buhl), Ivory, or Metal.

Ornament.—Executed after a specimen in the possession of the Hon. John Ashley.—One work sent in (metal).—First prize of £5 to T. R. Rice, 18, Suffolk-street, Essex-road, N.

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—After *Wyon's* heads of the Queen and the Prince Consort, on the Jurors' medal of 1851.—One work sent in.—No prize awarded.

(*b.*) *Animal.*—Work executed after *Wyon's* '*St. George and the Dragon,*" on the Prince Consort's medal.—One work sent in.—No prize awarded.

Class 12.—Engraving on Glass.

Ornament.—Work executed after arabesques by Lucas Van Leyden, 1528.—No works sent in.

Class 13.—Wall Mosaics.

Human Head.—After *Bertini*, of Milan.—One work sent in.—No prize awarded.

Class 14.—Gem Engraving.

(*a.*) *Human Head.*—After a cameo portrait of Savonarola, No. 7,541 in the South Kensington Museum.—No works sent in.

(*b.*) *Full-length Figure.*—After a small Wedgwood medallion, No. 5,827 in the South Kensington Museum.—No works sent in.

CLASS 15.—DIE SINKING.

Human Head.—After the head of the Prince Consort, by *Wyon*, on the Society's medal.—Three works sent in.—First prize not awarded. Second prize of £5 to A. Bouchette, 12, Percival-street, E.C.

CLASS 16.—GLASS BLOWING.

Ornament.—After an original in the South Kensington Museum.—No works sent in.

CLASS 17.—BOOKBINDING AND LEATHER WORK.

(*a.*) *Bookbinding.*—After an Italian specimen in the South Kensington Museum.—Three works sent in.—First prize of £7 10s. to John Jeffrey, 61, Charlotte-street, Portland-place, W.

(*b.*) *Leather Work.*—Outside covering of a jewel casket. Original in the South Kensington Museum.—No works sent in.

CLASS 18.—EMBROIDERY.

Ornament.—After a German example in the Green Vaults at Dresden, or an Italian silk in the South Kensington Museum, No. 7,468.—No works sent in.

CLASS 19.—ILLUMINATIONS.

Ornament.—After an Altar Card, attributed to Giulio Clovio, in the South Kensington Museum, No. 2,958, or a MS. border, date 1450, No. 3,057, in the South Kensington Museum.—Three works sent in.—First prize not awarded. Second prize of £3 to W. W. Burgess, 21, Market-street, Curzon-street, W.

SECOND DIVISION.

WORKS EXECUTED WITHOUT PRESCRIBED DESIGNS.

WORKS SENT IN COMPETITION FOR THE PRIZES OFFERED BY THE WORSHIPFUL COMPANY OF PLASTERERS.

Three works sent in.—First prize of £10 to R. W. Hanwell, 59, Charlotte-street, Caledonian-road, N.; and second prize of £5 to James Steele, jun., 25, Holmhead-street, Glasgow.

WOOD CARVING.

(*a.*) *Human figure in alto or bas-relief; animals or natural foliage may be used as accessories.*—Seven works sent in.—No first or second prizes awarded. Third prize of £10 to J. Meiklejohn, 58, Sussex-street, Pimlico, S.W., for a carving, "*The Introduction of Music to the Arcadians.*" An extra prize of £7 10s. to G. F. Bridge, 3, Vincent-square, Westminster, S.W., for a carving "*Purity;*" also one of £5 to Henry Jones, 9, Bedford-street, Seymour-street, Euston-square, N.W., for a panel, in oak, with figure of "*Wisdom;*" and one of £3 to G. Rumford, 19, Eccleston-street East, S.W., for a carving, "*Puck.*"

(*b.*) *Animal or still life. Fruit, flowers, or natural foliage may be used as accessories.*—One work sent in.—First and second prizes not awarded. Third prize of £5 to John Neaves, 26, William-street, Regent's-park, N.W., for a carving, "*Eagle and Prey.*"

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.*—Seven works sent in.—First prize of £10 to R. Baker, 11, King-street, St. James's-street, for a carving of a "*Festoon of Flowers.*" Second and third prizes not awarded. Two extra prizes of £3 each to G. H. Bull, 34, Albert-street, Regent's-park, N.W., one for a frame carved in pear-tree wood, and one for a frame in oak.

PARIS UNIVERSAL EXHIBITION OF 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for without delay.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

Proceedings of the Society.

CANTOR LECTURES.

FOURTH LECTURE.—MONDAY, JANUARY 22.

ON LIMITED LIABILITY. BY G. W. HASTINGS, ESQ., LL.D.

The following is a summary of Mr. Hastings's fourth lecture:—The most important of all the subjects with which economical science has to deal is the union of labour and capital—a marriage of which trade and profit are the offspring. It would be difficult to exaggerate the importance of accurately ascertaining, and of wisely regulating, so far as regulation is needed, and of wisely letting alone in all other cases, the conditions under which that union can be most readily and profitably effected. In considering these conditions the important question is forced on us—Does a limitation of the liability of the person advancing capital, in whatever shape, for the purpose of industrial production or commercial interchange, tend to foster that union which is the main end of an economical polity? This was truly, though for a time very little recognised as the point at issue in determining whether the principle of "limited liability" should or should not be adopted by the Legislature. There is nothing more remarkable in the history of such questions than the rapidity with which the principle of limited liability made its way legislatively into Parliament, and practically in its adoption by the people; a sure test of its having supplied a public want. It is not more than fifteen years since the principle was first seriously debated with a view to legislation, and within that time a Royal Commission has reported against its adoption.* At this time limited liability was opposed, not only by the fair and reasonable arguments which may always be urged against any considerable change, for which the burden of proof must lie on its advocates, but also by arguments, if they are to be termed such, of the most unfair and intemperate character, by the abuse and personality, the imputation of motives, which seem to constitute in all questions the staple of some persons' opposition. It used to be said that limited liability was dishonest and immoral, that it was a device to cheat creditors, and much of this kind. It may be presumed that there are few people who will advance such nonsense at the present day. Fraud may be practised with limited and unlimited liability alike, and there is no reason to believe that it is more particularly incident to either system. Of the two, perhaps, limited liability is likely to be the more exempt, because it is apt to make creditors more cautious, and thus diminish the opportunities for dishonesty. But let us consider what is the principle on which the obligation to meet any pecuniary liability must rest; it is simply in the promise to pay. The illustration which was once given of this point by a distinguished lawyer and judge, famous for going straight to the point, may be quoted as conclusive. If

* First Report of the Commissioners on the Mercantile Laws of the United Kingdom and the Law of Partnership, 1854.

A. B. enters a bootmaker's shop, orders a pair of boots and undertakes to pay for them, he is morally and legally liable, on the receipt of the goods, for payment. Even if he make no verbal promise to pay, he is still liable, because the law justly implies a promise to pay from his share in the transaction. But it is in the promise that the obligation rests. Suppose A. B. went to a bootmaker, and said, "Make me a pair of boots," but said, "I do not mean to pay for them." Clearly the moral obligation to pay never came into existence; if the tradesman is fully aware that the supply of the goods is on gratuitous terms, and is willing to accept those terms, he has no claim for payment. But then it follows that if A. B.'s obligation depends on his promise, he may limit that promise; he may say, "I will pay for the boots only out of this particular note of the Bank of England which I hold in my hand." In that case also the tradesman has fair warning, and knows the nature of the promise; and if the note be lost or paid away before he comes for payment, he must simply take the consequences of his own neglect or careless credit. This, familiarly stated, is the whole principle of limited liability. The obligation to pay arises from, and is coincident with, the promise to pay, and that obligation may be consequently limited to a particular amount or a particular fund, provided that due notice of such limitation be given to all whom it concerns. Limited liability is therefore a mode of trading, and as such should be treated. It follows that the State has no more right to interfere with it than with any other mode of trading, save to ensure the necessary publicity for the fact. It follows, too, that this mode of trading is just as applicable to natural as to juristical persons, to the individual trader as to the corporate or quasi-corporate body. Limited liability is constantly spoken of as if it were something necessarily connected with a company; that error has arisen from the empirical way in which the subject has been treated by government and the legislature. It being a principle of the law of partnership that every partner is liable for the business acts and obligations of the other members of the firm, and every shareholder in a joint-stock company being in the position of a partner, it followed, when the enterprise to be undertaken was great, and the capital great, the risk to individuals became heavier than could be borne. Parliament therefore stepped in, and by special Acts relieved the burden by limiting the liability of the shareholder to the amount of his shares. Then naturally arose the question, Why should this privilege be restricted to companies who are wealthy and powerful enough to obtain a special Act? Why not, by a general enactment, once for all, enable the promoters of any public enterprise to limit their responsibility? And, step by step, through a series of bills and acts, more or less harassing and restrictive in their provisions, Parliament throughout lagging behind the leading intelligence of the people, the boon was finally conceded by the "Companies' Act, 1862." But this does not touch private traders, and with respect to them there was a great hardship in the law which has only just been removed. It was decided in 1794, in a celebrated case (*Waugh v. Carver*), that if money were advanced to a trader on condition of receiving a portion of the profits, the lender thereby became a partner, and was consequently involved in all the liabilities of the concern. "He who shares profits must share losses," was the plausible but fallacious rule laid down, justified on the ground that the recipient of the profits took away a portion of the fund available for creditors. Like all other rules which interfered with the natural freedom of trade (and this interfered with the natural trade in capital, which would allow lender and borrower to settle the terms for themselves), the rule begot evasions. It was held that a bargain to receive interest on the sum lent proportioned to the profits was legal. Of course, when the usury laws were abolished, the evasion became much more easy. For more than ten years the mingled uselessness and unfairness of this rule were urged on the Government without success. A bill was indeed introduced by the Board of Trade, in 1854, for the repeal of *Waugh and Carver*, but it was so clogged with foolish provisions for registration that it had to be abandoned. Its authors apparently never had a glimpse of the principles on which such legislation should proceed. Last session an Act was at length passed repealing the rule; and thus limited liability has been extended to private trading, the ostensible partner (to whom alone the creditors have a right to look) being now alone unlimitedly liable. The question now arose, why should not the individual trader have the same privilege? Why should not any man, who chooses to post up "trading on limited liability" in his counting house, and putting the words on all his business documents, be able to limit his liability? If the principles stated in this lecture be sound, it is the logical conclusion that no legal obstacle should exist to such a course. So far from its standing in the way of credit, it would probably strengthen credit, for it would cause credit only to be given where it ought to be given, and on the sole basis which justifies it, viz., the tested solvency of the trader or firm who requires it. Mr. Hastings alluded to the effect which the rapid formation of limited liability companies must have on the administration of the bankrupt law in taking business from Basinghall-street to the Court of Chancery. He also touched on the important effect that was being produced in the relations between masters and workmen, not only in the creation of workmen's companies, but in the more rapid adaptation of the rate of wages to the profits of capital, arising from the publicity given to the profits made. He concluded with remarking that the apprehensions as to the amount of capital required for the companies which were so rapidly taking the place of private firms were exaggerated, inasmuch as the capital thus raised released the wealth now invested in private business, and this became available for other purposes.

Eighth Ordinary Meeting.

Wednesday, January 24th, 1866; Austen Henry Layard, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Barry, Francis Tress, The Clock House, Beckenham.
Bird, Robert, Crewkerne, Somerset.
Brown, D. J., 34, Great George-street, S.W.
Coley, Henry, Foxdale Mines, Isle of Man.
Crossley, Lewis J., Dean Clough Mills, Halifax.
Davis, Edward Francis, Tavistock House, Tavistock-square, W.C.
Fox, Chas. Douglas, 8, New-street, Spring-gardens, S.W.
Frere, Augustus, 22, Henrietta-street, W.C.
Lewis, John, Kidderminster.
Mackenzie, Wm., 12, Westbourne-square, Bayswater, W.
Mason, Rev. Joseph, Loughborough, Leicestershire.
McCormick, Wm., 22, Cambridge-terrace, Hyde-park, W.
Medhurst, Thomas, 465, New Oxford-street, W.C.
Merton, Louis, Junior Carlton Club, S.W.
Monkhouse, Rev. John, M.A., Church Oakley, Basingstoke.
Newman, Stephen John, 4, Church-terrace, Lady Well, near Lewisham, S.E.
Nixon, John, Cardiff.
North, George, 22, Whitehall-place, S.W.
Pelly, Charles Raymond, 129, Park-st., Grosvenor-sq., W.
Smith, George, L.L.D., Trevu, Camborne, Cornwall.
Spence, Joseph, Holdgate-hill, York.
Stevenson, John, Baxter-gate, Whitby.
Stonehouse, Wm., Abbey-terrace, West Cliff, Whitby.
Trickett, Henry, 67*a*, Hatfield-street, S.
Worthington, Richard, 27, Mincing-lane, E.C.
Yeates, Horatio, 221, Regent-street, W.

vailed, as to the Sunday opening question, among those who lately waited on the Lord President of the Council, there has always been absolute unanimity in condemning the closing of the British Museum reading-room and collections at nightfall. And here I should like to address a few words of counsel to those of the working-classes that have been taking part in the recent agitation; and to them I would say, if you wish for success, you are on the wrong scent altogether, and must change your tactics; these deputations and counter-deputations to the Lord President of the Council are thrown away; these appeals for the lighting of the British Museum collections are unavailing. By the course you are adopting, you are, so to speak, carrying out the saying of "putting the cart before the horse." If you really wish to obtain that for which you are agitating, put aside for the nonce each your own crotchet, and merge your differences in one; this done, gird up your loins, and having secured, as you doubtless will, the support of your representatives in Parliament, make a "long pull, a strong pull, and a pull altogether," to try and obtain some modification in the system of irresponsible management which now prevails at Bloomsbury, and from which, as long as it lasts, neither the Lord President of the Council, nor any one else, will be able to obtain even a hearing; or, if he should succeed thus far, he would be sanguine, indeed, who expects that even the youngest of those who are present would live long enough to learn the result of their solemn deliberations. There is one gentleman, recently elected for one of the Metropolitan boroughs, who will remember the following quotations; they are from his own works; the author of them cannot refuse his co-operation in your crusade against irresponsible boards; they are words of sound sense, and do great credit to the good sense, the intelligence and practical wisdom of Mr. John Stuart Mill:—

"Things are much worse when the act itself is only that of a majority—a Board, deliberating with closed doors, nobody knowing, or except in some extreme case, being ever likely to know, whether an individual member voted for the act or against it. Responsibility, in this case, is a mere name. . . . What "the Board" does is the act of nobody; and nobody can be made to answer for it. The Board suffers, even in reputation, only in its collective character; and no individual member feels this, further than his disposition leads him to identify his own estimation with that of the body—a feeling often very strong when the body is a permanent one, and he is wedded to it for better for worse; but the fluctuations of a modern official career give no time for the formation of such an *esprit de corps;* which, if it exist at all, exists only in the obscure ranks of the permanent subordinates. Boards, therefore, are not a fit instrument for executive business; and are only admissible in it, when, for other reasons, to give full discretionary power to a single minister would be worse. . . . As a general rule, every executive function, whether superior or subordinate, should be the appointed duty of some given individual. It should be apparent to all the world, who did everything, and through whose default anything was left undone. Responsibility is null, when nobody knows who is responsible. Nor, even when real, can it be divided without being weakened. To maintain it at its highest, there must be one person who receives the whole praise of what is well done, the whole blame of what is ill."—*John Stuart Mill's Considerations of Representative Government*, pp. 250, 251.

"Though the supplies can only be voted by the House of Commons, and though the sanction of the House is also required for the appropriation of the revenues to the different items of the public expenditure, it is the maxim and the uniform practice of the Constitution, that money can be granted only on the proposition of the Crown. It has no doubt been felt, that moderation as to the amount, and care, and judgment in the detail of its application, can only be expected when the Executive Government, through whose hands it is to pass, is made responsible for the plans and calculations on which the disbursements are grounded." Again—"It may be sufficient to say, that the classification of functionaries should correspond to that of subjects, and that there should not be several departments independent of one another to superintend different parts of the same natural whole." Again—"The entire aggregate of means, provided for one end, should be under one and the same control and responsibility."—*Stuart Mill on Parliamentary Government.*

Thus far I have tried to show you that public interest is thoroughly aroused in these questions; and, if so, no one will deny that the subject is sufficiently important to engage your attention. Next, then, it behoves us to consider, in the third place, whether there is any just cause of complaint against the management of our national collections; and first, let us ask, Are they made as available as they might be made for the education, as well as for the enjoyment, of the people; secondly, ought Government assistance to be solely confined to the parent institutions in London; and, thirdly, let us consider, if changes in their management be necessary, in what way they can be most conveniently made?

Now, to the first question, I fancy, there can be but one answer. I do not imagine that even the members of those mysterious Boards, to whose care our collections are entrusted, would venture to answer it in the affirmative. What the British Museum was fifty years ago it is pretty much the same now; it is quite the most conservative institution that I know. Fifty years ago, indeed, the British Museum might, and for aught I know did, satisfy fully the requirements of those who lived at that time, but even if it were so then, has the world seen so few changes since that time that it should follow, as a matter of necessity, that what was sufficient fifty years ago should still be sufficient now? Granted, then, for argument's sake, that fifty years ago the British Museum supplied the wants of that period. But, fifty years ago, steam navigation was unknown, and the wants of the traveller at home were fully met by a service of well-appointed stage-coaches. Fifty years ago a few seven-penny newspapers amply supplied the wants of the reading public. Fifty years ago Sir Rowland Hill had not won for himself the gratitude of his country, and no one at that time felt aggrieved at the levy of a seven-penny tax upon every letter that was written; fifty years ago, too, express messages were confided to the wings of a bird; and fifty years ago this country was engaged in a European war, and the anxiety of the public could only be relieved at intervals by the uncertain arrivals of an *estafette.* Forty years elapsed, and ten years ago the country was again engaged in the strife of battle, and bitter indeed was the outcry if almost daily bulletins were not flashed across Europe, with such speed that the widow and the orphan knew of their bereavement, almost before the booming of the last cannon had died away on the field of battle. In the last 50 years incredible changes have been brought about by the science and ingenuity of man, and many of the influences by which the past generation was surrounded have been modified or swept away. If the wants of the people in almost every other relation of life have undergone great changes, depend on it the means of providing them with healthful and educational recreation will be found to be no exception to the general rule.

Now, the first question we have to ask ourselves is, are our national collections made as available as they might be for the education and enjoyment of the people? I lay stress on the word education, for, to my mind, a museum, to be useful and popular, must be educational. Nor am I by any means solitary in holding this opinion; if time would allow, I could quote the opinion of some of the greatest authorities in my support, among whom there is no one whose authority is greater than our chairman of this evening. And, as at present managed, no one can suppose the British Museum to be educational; indeed, with the exception of the magnificent library and reading-room, which the country owes to the zeal

and ability of Mr. Panizzi, it does not even profess to be educational, while the library and reading-rooms are daily closed at dusk, *i. e.*, after work hours of the artizan, and at the very time when of all others it would be most accessible to those by whom the privilege would be most valued, and whose moral well-being it is so much our interest to promote.

As it was in the beginning, so it is now, and the British Museum authorities appear determined to adhere literally to the words used in their Act of Parliament, and to confine their collections to a display of the "rare and curious," and nothing more. But, surely, this is an old-world view to take of the uses of such treasures as are there stored up. For my part, I have no hesitation in affirming that these sculptures and treasures of Etruscan, Greek, and Egyptian art have a practical and positive value beyond their "rarity" and "curiosity," and that the time is fully come when those to whose care they are entrusted should be compelled not only to recognize but to carry out this principle.

The "rare and curious" are intended to give a light to assist the ingenuity of man, to be a guide to improve his labour, and thus to become the means of promoting inventions which shall confer solid benefits on those who live in the present age. Although the "rare and curious" are in themselves not necessarily educational, yet they are without doubt absolutely required in any system that shall have that aim. There is, we must remember, in one sense, nothing new in this world. All that we can do is, while carefully fixing our eyes on the past, to re-invent and re-combine the discoveries of our forefathers, and the more we study these, the more original we become.

This is a truth that never forces itself more strongly on the mind than on the occasion of a visit to the streets of Pompeii, or to the wonderful collections stored up in the Royal Museum at Naples. What do we produce at the present day superior in beauty and fitness of design, or in harmony of colouring, to that which, after being buried in cinders for 2,000 years, has been again brought to light? Which of our sculptors can hope to excel the grace and proportions of the statuary and bronzes, mutilated and defaced though they be, that are from time to time recovered from the charred ruins of the buried city. Turn again to the Royal Museum at Naples, and you will find of what the science of 2,000 years ago was capable. Every conceivable device for supplying almost every want of man is there to be found; some perfected in most graceful forms—lamps, compasses, inkstands, surgical instruments in great variety, and many of which would, if they were reproduced in the present age, be considered as *chefs-d'œuvre* of ingenuity. And yet we see how a people, possessed of all these numerous specimens of the "rare and curious," failing to use them for the purposes of study, allow other nations, once far behind them, to outstrip them altogether in the race of civilization and progress.

The Trustees of the British Museum, by the course they adopt, would appear to have endorsed the remarkable dictum of one of the most able of their officers. It is that which was given before a parliamentary committee, when Professor Owen being pressed as to his view of the uses of the British Museum, declared that he did not object to its being educational or recreational, but that "both should be secondary to the main idea of presenting a complete series of created works."

Now, far be it from me to dispute the opinion of so eminent an authority as Professor Owen. All I will say is, that my capacity is so limited that I cannot understand what higher object "a complete set of created works" can have than the development and education of the mind of man—developing his intelligence and teaching him to recognise in "the complete set of created works" the bountiful wisdom and infallible Providence of the Creator Most High. I feel that it is too much to expect the trustees of the Museum to take any such practical view of the subject; accordingly, the objects under their care remain for the most part unlabelled, or imperfectly labelled, and are neither arranged nor exhibited in a form intelligible to the ordinary visitor; and on this point I must once more appeal to authorities greater than any I can be supposed to possess. Abundant testimony to this is to be found in the voluminous "Blue Books" laid before Parliament, in one of which our distinguished chairman of to-night is reported to have condemned, in terse language, a system of arrangement like that at the British Museum, by which the visitor is introduced to art collections through a long vista of rhinoceros and giraffes, and to a niche in which vista I should never be surprised to learn that our esteemed friend, Mons. Du Chaillu's gorilla, is the last and most distinguished addition.

It is possible that the value and merits of the collections, even as they are now, may be clear enough to the learned, dignified, and very numerous body to whose care they are entrusted; but to the individual visitor, the uneducated, or the artizan, their value must be lost, and their significance must be utterly unintelligible.

But the national collections in London, to my mind, ought not only to assume a more educational character; there is another duty, equally imperative on them, and one which they are equally bound to perform. It is a duty which would be productive, I believe, of most happy results.

The national collections located in London have been paid for by national funds; and, in my opinion, they should be bound to give a helping hand to those national museums and other collections which are established in the various provincial towns, especially those in Edinburgh, Dublin, and the great centres of manufacturing industry, such as Manchester, Liverpool, and Birmingham. Now, among other recommendations of such a system, there is one that commends itself as being of an eminently practical nature. During the last few years there have been constant complaints, both at the National Gallery and British Museum, of the want of sufficient room for the proper exhibition of our collections, and on more than one occasion the Government have announced their intention of erecting new buildings to remedy this defect. But for new buildings, large funds would have to be voted, and any such proposal was sure to be met by objections from some quarters in the House of Commons (objections, I am bound to say, not without force) to voting national funds to house collections already overgrown, and the advantages of which would be solely confined to the inhabitants of the metropolis. If, then, the national institutions could be brought to acknowledge their position as parent institutions, it follows as a matter of course that they would discharge the duties of a parent, and afford every assistance in their power to those other institutions established in the provinces, and would thus effectually demolish one of the powerful arguments against providing proper buildings for our national collections.

Now, the principle involved in this is by no means a new one. That the London museums should extend their support to provincial ones is a principle that has been recognised by no less an authority than the report of a parliamentary committee, and has been acted upon more or less by the President of the Council, with such resources as are to be found in the museum at South Kensington. "Having arrived at the conclusion (says that report) that that museum, in respect of its action, as well throughout the United Kingdom as in the metropolis, is exercising a beneficial influence and fully deserves Parliamentary support." This forms the last paragraph of the report of the committee which was appointed at the instigation of the Right Hon. Robert Lowe in 1860, and in it is to be found the distinct acknowledgment, that the collections bought with public money should be made as available as possible for the uses of the public throughout the United Kingdom; and more, that the managers of these

collections should do their utmost to foster and encourage a taste for the fine arts.

Now there are several ways in which this object may be effected. Indirectly, as it has been by the Department of Science and Art, in establishing or helping to establish schools of art in the Provincial towns of the kingdom. Up to the year 1852 this system was altogether unknown in England; but it is clear that to whomsoever the suggestion was due, it was eminently a happy one, and has been responded to in a manner to show that it has met with and supplied that which was felt to be a great public want. From returns laid before Parliament I see that more than 100 places have taken advantage of the terms thus offered to them. In many places the schools thus nurtured in infancy have now taken root, and flourish in an independent form. But, besides this, there is another and a more direct way of making the parent institutions assist those which are established in the provinces; and that is to establish, under proper regulations, a system under which should be circulated such objects of art or pictures as can be spared from the parent institutions among the provincial museums and galleries.

Now I do not conceal from myself the consternation and bewilderment into which such a proposal as this will throw the trustees of the British Museum and of the National Gallery. The only solace I can give them in their trouble is to remind them once more of my oft repeated conviction, that, as long as they continue to hold their citadels of nebulous irresponsibility, there is but faint hope, indeed, of carrying into effect even so innocent an innovation as this, to other minds, would appear to be.

It would be well to examine and see whether there is, in fact, anything very alarming in such a system. It might also be well to inquire whether we have any data by which we may be guided in deciding whether it might not be possible to carry it out, not only without detriment, but with positive advantage both to the donor and recipient.

For this purpose, it will be well to examine what is the actual state of our national collections in the metropolis. They consist of the British Museum, National Gallery, National Portrait Gallery, the Soane Museum, and the Dulwich Gallery. Of these, the two latter may shortly be disposed of. For several reasons they are almost unknown; indeed, until the International Exhibition of 1862, I doubt if "the oldest inhabitant" in Lincoln's-inn remembers the advent of a single visitor to the Soane Museum, the trustee of the Soane collection, named by this Society, of course being excepted. There remain the National Gallery, National Portrait Gallery, British Museum, and South Kensington. To the directors of the National Gallery, then, I must make an appeal—no easy task, when you know not to which member of the Board you are addressing yourself, nor even whether the appeal will ever reach their ears at all; and so I must take my chance, and ask them if there are not many pictures now under their care which could well be spared, to make room in the limited space on the walls for other and more valuable works, and if there have not in the last few years been many more that have been sold for almost nothing; and if there are such, then what can the objections be to framing rules for the establishment of a system by which these superfluous works may be circulated among the galleries of the United Kingdom. The objection cannot be grounded on the fact that they would be lost to the metropolis; for the system of giving pictures has already been acted upon in the case of the galleries at Dublin and Edinburgh. But in the case of pictures and drawings, it is not gifts that I advocate: the system of circulation by loans is to be preferred. It is evidently greatly to the advantage of the students in the provincial towns to have their pictures changed from time to time, affording, as that would do, a variety of both styles and colouring most useful and refreshing to those engaged daily in the study of painting. That it would be a boon most welcome may be seen from the following speech of Sir Stafford Northcote, delivered last November at Exeter:—

"I think we may hope that the important organizations we have in London—the South Kensington Museum and the Department of Science and Art—are now awakened to a sense of the importance of doing something, not only for the metropolis, but for the whole country. (Applause.) A committee, on which I had the honour and pleasure to serve two or three years ago, called special attention to this subject, and I am anxious to refer to it, because I wish to encourage those who are taking an active part in the promotion of other institutions, and who are looking especially to the Museum, with this consideration, that if they can erect this building, and provide proper accommodation for the specimens which may be brought to them, there is reason to believe that the directors of the South Kensington Museum will enrich our collection with very valuable specimens by way of loan for considerable periods; that while we are ourselves able to collect—indeed, we have already begun a collection, a collection of interesting specimens illustrative of the natural history, antiquities, and science of Devonshire—we at the same time may be able to obtain from that magnificent national collection, which is far more than the inhabitants of the metropolis can enjoy, *and which, while situated in the metropolis, is very much beyond the reach of the provinces*, from time to time, loans of most valuable specimens, thus adding a new and constantly renewed interest to the institution which we are establishing in the "Albert Memorial Museum. (Hear.)" The country would then do, with local co-operation, but with its own pictures and for its own ultimate good, that which the wealthy have long done with safety and liberality at the British Institution and elsewhere. There remains, then, but one objection which the Directors of the National Gallery can allege, and that is one which it would be, indeed, very remarkable as issuing from such a quarter, namely, the fear that the pictures might meet damage or disaster.

Now, considering that two of the most remarkable of modern pictures, Frith's "The Derby Day," and the "Horse Fair," by Rosa Bonheur, which were by will confided to the safe keeping of these same trustees of the National Gallery, have been allowed, not only to leave London, but to leave the country, and to encounter endless perils by land and by water in their travels round the globe, for the benefit of a distinguished publisher, I cannot believe that even the trustees of the National Gallery can have the face to base their objections to a regular system of provincial circulation on the ground of danger to the works so circulated. And there are other and special reasons why in this country and at this time we are most favourably situated for giving such a system a fair trial. Some few years ago one of the greatest of English artists died and left to the nation the entire collection of his pictures, sketches, and drawings. Now, it would be presumptuous on my part to descant on the wonders of the Turner Gallery, or to attempt any eulogium on his acknowledged merits. But, in order to show the immense value that these works have for the student of art, I may be permitted to give the following description, from the pen of Mr. Ruskin, of the peculiar excellencies of the late Mr. Turner, which appears in the pages of "Modern Painters, their Superiority in the Art of Landscape Painting to the Ancient Masters:"—

"And such is indeed, the case with every touch of this consummate artist; the essential excellence—all that constitutes the real and exceeding value of his works, is beyond and above expression; it is a truth inherent in every line and breathing, in every hue, too delicate and exquisite to admit of any kind of proof, nor to be ascertained except by the highest of tests—the keen feeling attained by extended knowledge and long study."—p. 403.

"In every new insight which we obtain into the works

of God, in every new idea which we receive from His creation, we shall find ourselves possessed of an interpretation and a guide to something in Turner's works which we had not before understood. We may range over Europe, from shore to shore, and from every rock that we tread upon, every sky that passes over our heads, every local form of vegetation or of soil, we shall receive fresh illustration of his principles—fresh confirmation of his facts. We shall feel wherever we go that he has been there before us; whatever we see, that he has seen and seized before us; and we shall at last cease the investigation with a well-grounded trust, that whatever we have been unable to account for, and what we still dislike in his works, has reason for it and foundation like the rest; and that even where he has failed or erred there is a beauty in the failure which none are able to equal, and a dignity in the error which none are worthy to reprove."—pp. 404, 405.

This collection consisted of no less than 19,331 pieces. Of these were—

Finished pictures	100
Unfinished	182
Drawings and sketches	19,049
	19,331

As a matter of course it contained many specimens of the earliest as well as the latest of the works of this great artist. To exhibit them all at the National Gallery in Trafalgar-square was out of the question. To Mr. Ruskin therefore was entrusted the task of their arrangement and classification. It was a work of great labour and no little difficulty. The task accomplished, Mr. Ruskin's report was sent in, was approved by the Trustees of the National Gallery, and was endorsed in the report which is annually laid by them before Parliament. That document was published in 1858, and was signed by the honoured name of Sir Charles Eastlake, as President of the Trustees. And here I would gladly add mine to the general expression of deep regret which the death of Sir Charles Eastlake has called forth, and would express the sense which I entertain of the loss sustained by theNational Gallery and the Royal Academy by this melancholy event. An unimpeachable judge of Italian art, Sir Charles possessed some of the highest qualifications for his difficult post, a calmness of judgment seldom met with, and a caution which was never ruffled. He has been called away at a time when he could ill be spared, when his peculiar merits would have been of the greatest value. I have had, on more than one occasion, the opportunity of hearing Sir Charles Eastlake express himself on the various controverted topics of the day relating to art; and, from his calm good sense and clear judgment, I feel confident that the principle of irresponsible Boards without Parliamentary chiefs met with no sympathy from him. Placed as he was, and where he was, he had no choice but to act to the best of his judgment, and sure am I that it was his sound sense and courteous demeanour that alone made it possible to continue, even for a time, such ill-defined and jarring relations as exist, under the present system of management, between the Trustees of the National Gallery and the Government. He must surely have felt, as I feel, and everyone else would feel, that, with any other form of government but a body of trustees, suggestions which were made by so great an authority as Mr. Ruskin, and which had been adopted and recommended to Parliament in annual reports and in obedience to a distinct commission, would not have remained a dead letter from 1858 until now.

Incredible as it may seem, it is now eight years since the report of which I speak was presented to Parliament, and embodied in it was the following opinion of Mr. Ruskin relating to the Turner Gallery, and to which I have already made allusion:—"The remainder of the collection consists of drawings of a miscellaneous character, from which many might be spared, with little loss to the collection in London and *great advantage to the students* in the provinces. Five or six collections, each completely illustrative of Turner's mode of study and succession of practice, might easily be prepared for the Academies of Edinburgh, Dublin, and the principal among the English manufacturing towns."

Now, here we have it stated by one of the greatest authorities on these subjects, and one who has devoted especial attention to the style and works of this collection, that the trustees of the National Gallery have in their possession, and have had for eight years, sufficient of the drawings of this great artist to form five or six collections, each "*completely illustrative* of his modes of study and succession of practice," and of great advantage to the student, and which could be well spared from the London collections. For this fact we have the word of Mr. Ruskin, and, more than that, we have the assent of the trustees of the National Gallery themselves, who embodied these suggestions in their report. By what right, then, have these drawings been hidden away in Trafalgar-square for so many years? or what can the nation do better with them than to distribute such great and useful works to enrich the galleries at Dublin, Edinburgh, Manchester, Liverpool, or Birmingham? Nor have I the time now to strengthen my case by pointing out in detail as I could the immense waste incurred from time to time by the sale of inferior pictures, many of which would have been invaluable for forming the nucleus of provincial galleries. But if I feel any difficulty in addressing the trustees of the National Gallery, that feeling is greatly increased when I find myself trying to obtain the ear of the trustees of the British Museum.

The trustees of the British Museum form a Board which, in the words of Jeremy Bentham, "is a screen. The lustre of good desert is obscured by it; ill-desert, slinking behind, eludes the eye of censure; wrong is covered by it with a presumption of right, stronger and stronger in proportion to the number of folds: and each member having a circle of partial friends, wrong, in proportion again to the number, multiplies its protectors." The Trustees form a very numerous Board, without a Parlimentary chief, and are not therefore easy to bring to a decision. To whom, then, shall I address myself? Shall I apply to that part of the trustees composed of all the great officers of state, or to that other section, composed of all the talents, or to those other trustees (of whose vested interests we have often heard)—trustees who are called by the "cosy" title of "family trustees," whose ancestors were fortunate enough to obtain a good price from the nation for collections which they wished to sell, and by virtue of which stroke of good fortune they have earned a voice in the management, not only of those collections, by the sale of which they were enriched, but also in all the other collections of the nation, besides having an indirect share in the patronage which is connected with many thousands of pounds of the public money voted annually by Parliament. And here I would say that I have no intention of entering at length into the merits or demerits of government by Boards; it is one of the proofs of the great advance this question has made, that no such argument is necessary. Still less is it my intention to speak disrespectfully of any of the members composing the Board (and, by-the-by, considering how numerous it is, that is saying not a little). Among the trustees there are many of the most eminent and able men of the day; but my objection is not to these men being there, but to the fact that from the very nature of the body into which they have been absorbed, the field for the exercise of talent is by the ill-defined nature of their duties restricted and narrow.

The case of the British Museum is even stronger than that of the National Gallery; and, looking at the state of the various collections, I should have no doubt as to the success of the appeal were it made to any other form of governing body than the trustees. It would be

hard to suppose that there are not at present at Bloomsbury an infinite variety of objects now stowed away and unseen which are virtually duplicates, and which are not required there, even for a complete representation of the separate classes of science and art.

Take, for example, one case out of many, and that one of the most recent—that of Mr. Newton, the keeper of Greek antiquities. This gentleman is a most distinguished officer of the Museum, and from time to time gives (not at the Museum) lectures on the Greek and other excavations. He deals with his subject in a lucid and exhaustive manner, and no lectures are more popular, displaying, as they do, a thorough knowledge of his subject. Well, I should like to ask Mr. Newton—so competent to give an answer—whether he has not hundreds of specimens of these excavations under his charge now which are taking up room, that can ill be spared, and the removal of which would not mar his collection or break his heart; and of Mr. Birch, another distinguished authority, I must ask the same question with regard to the Egyptian antiquities under his charge; and before making any other appeal, I will lay down, as a broad rule, that no collection can possibly be made which, if additions are constantly made, must not contain some superfluities. With the increased facilities for travel and making researches, old and indifferent specimens must constantly make way for new and more perfect ones. And bearing this in mind, I will boldly appeal to the various other officers of the Museum, and ask if they have not of their superfluity to give, at all events, until they are housed in the new buildings which we have been so long promised; nor must we forget here that the system of circulation will, by assisting the museums in various towns in the country, obtain the support of Members of Parliament in those districts which have been benefited by it, and thus diminish the opposition to the vote of money required for the erection of buildings for housing collections, the benefit to be derived from which will not be confined to inhabitants of London alone. Whether this system of circulation be good or bad, it is at any rate not untried in this country. It is now in operation under the Department of Science and Art, and has been carried out there with limited means but with unlimited success.

But there is another authority to which we may turn in proof that a system of gifts to local museums may be in force without in any way interfering with the completeness of the parent institutions. In France the system of gifts to provincial towns has been and is extensively acted upon. Any one who has travelled in France must have been struck by the number of museums in provincial towns, as showing the extent to which this system of donations has been carried out, where pictures and objects of art were labelled as the gift of the nation. I venture to submit the following list of sixty-three provincial institutions that have been benefited more or less under this system.

Aix. Antiquities and very mediocre pictures.
Angers. Large collection of mediocre paintings, some sculpture, and, in an upper story, natural history and a few antiquities.
Angoulême. Small collection of natural history.
Amiens. Municipal. Antiquities and paintings.
Arles. Antiquities.
Avignon. Antiquities, Roman and otherwise, and pictures. Founded by Calvet, a native of Avignon.
Avignon. Natural history.
Avranches. Antiquities and pictures.
Besançon. Objets d'art and antiquities, and 400 paintings. Founded by a native named Paris.
Bordeaux. Antiquities, chiefly Roman, and natural history.
Boulogne. The Town Council. Miscellaneous collection of sculpture, medals, Roman antiquities, pictures, and natural history.
Bourges. Antiquities and curiosities without order or arrangement.
Brest. Models of ships, shipheads, etc.
Caen. Natural history.
Caen, Municipal. Collection of paintings.
Calais. Fine Arts, contains a picture of the Virgin, ascribed to Correggio.
Carpentras. Antiquities.
Chartres.
Cherbourg, municipal. 164 pictures. Founded by Thomas Henry, a native of the town.
Clermont. Natural history.
Colmar.
Compiègne. Municipal. Founded by M. Vivenel.
Dijon. Municipal. Rich and important monuments of the middle ages, royal tombs, and numerous paintings.
Dinan, municipal. Geology and antiquities of the district.
Douai. Antiquities and pictures (Old Flemish school).
Dreux. Curiositities, some sculpture, &c.
Evreux. Antiquities.
Grenoble. Natural history.
Grenoble. Large collection of mediocre paintings.
Havre. Pictures by Troyon, Yvon, Couture, &c.
Langres. Antiquities, pictures, and a collection of birds from S. Africa.
Le Mans. Municipal. Natural history and paintings.
Le Puy. Some mediocre paintings, some Roman antiquities, and good collections of the geology and mineralogy of the distrist.
Lille. Municipal? Pictures and drawings by the old Italian masters, Raphael, Masaccio, Fra Bartolomeo, Michael Angelo, &c. Founded by Chevalier Wicar.
Lyons. Roman antiquities and several paintings of celebrated masters, also a small collection of Majolica, porcelain, Limoges enamels, and Pallissy ware.
Marseilles. Antiquities and pictures.
Montpellier. Collection of excellent paintings. Founded by M. Fabre.
Nancy. Antiquities.
Nancy. Modern pictures, by Isabey, and some relics of Napoleon. Founded by General Drouet.
Nantes. Natural history and fragments of antiquity. Founded by M. Dubuisson.
Nantes. Paintings. Founded by M. Cacault.
Narbonne. Antiquities and pictures. Founded by a local antiquarian society.
Nismes. Antiquities. Founded by M. Perrot.
Nismes. Antiquities and pictures.
Orleans. Pictures, local antiquities, carvings in ivory, wood, and stone; old furniture, iron-work, &c.
Pau. Natural History of the Pyrenées.
Perpignan.
Poitiers. Natural history and antiquities.
Rennes, Municipal. Pictures.
Rouen, Department of the Seine Inférieure. Supported by voluntary donations. Antiquities and works of art of the Middle Ages. Founded by the Department of the Seine Inférieure, 1833-4.
Rouen. Natural history.
Rouen, Municipal. Pictures attributed to the old Italian masters and others of the modern French school.
St. Etienne. Specimens of the staple manufactures of the town, ribbons, and gems, also a mineralogical collection.
Saumur. Antiquities found in the department.
Sèvres. Supported by the state. Porcelain from the earliest period of Greek and Etruscan art to the most recent productions of the nations of Europe and Asia, China, Japan, and the East Indies, and many of the rude tribes of America.
Soissons. Antiquities.
Strasburg. Collection of bad or second-rate pictures.
Strasburg. Natural history.
Toulon. Collection of naval models.
Toulouse. Municipal. Pictures and casts, antiquities,

works of art of the middle ages, and monuments of the Renaissance. Founded by M. du Mège.
Tours. Collection of nearly 200 pictures and some casts.
Troyes. Paintings and sculptures, including some architectural fragments.
Vienne. Sculptured and architectural fragments found in and about the town.

Let it not be inferred that the French system is by any means perfect. As I have already said, I feel strongly that, in the case of pictures and drawings, a system of circulating loans is preferable to simple donations. These, then, are some of the reasons which induce me to think that Government aid and assistance should not be confined to the institutions in London.

Not only do I say it should not, but I aver with confidence that had the National Gallery been under the direct control of a minister responsible to Parliament, those six collections of the Turner drawings would not have been allowed to remain hidden in Trafalgar-square eight years after they had been reported by the greatest authority of the day as not required there, but as being capable of great benefit for purposes of study in galleries and museums of the large towns.

To the collections of the British Museum these remarks apply with even greater force, nor let it be supposed that I look upon the plan which I have ventured to recommend as a complete panacea against the evils attending the system of trustee management. Even if it were carried out to-morrow there would remain a long list of charges—charges which are numerous and grave, but consist too much of details to be dealt with in the scope of a paper like this. In general terms, my charge is that the Trustees of the British Museum lag indolently behind the spirit of the age, and either cannot or will not administer their magnificent collection, their vast revenue, so that it should be made as available as possible for the education and recreation of the people. But perhaps the best summary of the results of the present system of management at the British Museum is to be found in a very able article which has appeared in the last number of the *Edinburgh Review*, and which must have much greater weight than anything I could say:—

"Year after year in Parliament Mr. Gregory, like a Jeremiah, lifts up his voice at the present state of the arrangements and neglect in the British Museum, so that we need not draw up, as might be done, a long indictment against the trustees for their miserable treatment of the noble collections confided to their charge. The state of the collections is a national disgrace. An over-crowded building, most unsuitable for exhibition, most unhealthy to visitors, and destructive to many objects from insufficient ventilation; ill-cared for and ill-lighted; specimens of sculpture disfigured with dirt; specimens of natural history crowded in cases which are not dust-tight and sluttishly neglected; labels wanting—there is throughout an air of sleepy slatternly shabbiness, except in the libraries and a few other portions, which renders it imperative that Parliament should transfer the annual vote of £100,000 from the hands of the trustees to a more competent and sensible management. So long as Parliament continues the folly of entrusting forty-eight trustees with this immense annual expenditure, so long as this *fons malorum* remains untouched, it is useless to preach other reforms."

Look at the nation at large and see how many years it is in advance, in its ideas of liberality, of the various Boards of Trustees. Generous, indeed, have the possessors of art treasures in this country shown themselves in lending their objects of art for the recreation and instruction of the public.

Nearly all the *chefs d'œuvre* of the principal collections in this country have been, from time to time, by the generous good feeling of their owners, lent for public exhibition. In this good work, our Queen has led the way; from the year 1853, when at Marlborough House Her Majesty lent a collection of Sèvres China, value £20,000, down to the year 1862, when the fruits of Her Majesty's beneficent example were shown in presenting to the public that which was known as the Art Loan Collection, universally acknowledged to be the finest collection ever displayed for exhibition in this or any other country. But even this great effort did not exhaust the kind liberality of those who had objects of art worthy to be seen. Since 1862 we have had the interesting collection of Mulready's works, to which the Queen was again a liberal contributor, and last summer a magnificent selection of miniatures were lent ungrudgingly for exhibition by those who had them to lend; and now we are promised a further advance still in a collection of many of the finest national portraits, which is to extend over some years, and the originating of which we owe to the spirit and taste of the Earl of Derby. Had I time I would pause here and note a fact which to some may appear anomalous, that this great national undertaking is *not* being carried out under the auspices of the trustees of the National Portrait Gallery, within the scope of whose duties, to all ordinary minds, it would have seemed especially to be.

And as in the metropolis, so in the country generally, the same liberal spirit is found to prevail among private individuals, and many is the provincial exhibition and museum which almost depends for existence on, or at all events as in the case of Reading last summer, greatly benefits by the kindly feeling of its neighbours. What the Queen and her subjects do so ungrudgingly, surely it is not too much to ask our National Institutions to do as well.

And now there remain but two things for me to consider:—I have striven to show you, in the first place, that it is a subject that is strictly within our province to discuss; secondly, that the question is worthy of discussion because it is a subject that is daily attracting more and more of the public attention; thirdly, I have endeavoured to point out to you that the management of our national collections is not as successful as it should be, and have further ventured to recommend for trial a very simple system which has been successfully tried elsewhere, and which, while it tends to destroy any jealousy that may be felt in the country as to the great advantages enjoyed by the art-student in the metropolis, will at the same time cherish and foster a taste for the fine arts in the hives of manufacturing industry and the other large towns of the empire. And now it only remains for me to inquire, first, if the present is a fitting moment for such a discussions? and, secondly, to say what remedy I propose to apply in the present conjunction of affairs. And surely to this first inquiry there can be but one answer. It appears to me that every possible occurrence combines to show that the moment is opportune. In the first place, an event which we all deplore, has recently caused a vacancy in the principal post among the Trustees of the National Gallery; and at Bloomsbury we have the resignation of Mr. Panizzi, who, though he was nominally the servant of the Trustees, appears to have been, in fact, their master, their guide, and familiar friend. And, besides the fact of these two vacancies, we have the evident hesitation shown by her Majesty's Government in filling them up. Indeed, I will go further than declaring the moment opportune. I will assert that now, if ever, is the time for bringing about a reform in, or an improved form of relations between the Government of the country and Boards of Trustees.

It was with something like feelings of emotion that I have heard the rumours that have for some time past been current, that Downing-street is not the only place, nor Lord Russell and his colleagues the only body that are holding councils on the question of reform.

If it be true that such a question is being seriously entertained in the Board-room at Bloomsbury, then, indeed, there can be no doubt that the moment for our discussion in this hall to-night is, at all events, not premature; and this brings me to the next question, and the last with which I shall trouble the meeting to-night, What do I

propose to do to remedy a state of affairs which is so unsatisfactory? It is now four years since I had the honour of laying before the House of Commons much the same views that you have heard to-night. Since that day I have taken no steps to hurry the question to a premature crisis. The views which I urged on the House of Commons in 1862, and in this hall to-night, were and are a simple condemnation of irresponsible Boards for managing the national collections. The views that I then held and now hold were based upon the opinions elicited during the various discussions which have taken place upon this question. In those discussions I have found that a vast majority of those whose opinion was worthy of consideration was strong and decided against such a system. Besides the distinguished statesman who has done me the honour of taking the chair to-night, every independent authority I have consulted has been of one mind. Nor was it only from those who were independent that I have received the fullest confirmation. I have before me the opinions of several of the most eminent servants of the Trustees, who, to their honour be it spoken, have not shrunk from adding the weight of their conviction, founded as it is on long and intimate experience with the working of the Museum. If I had time I could quote from the answers given by Professor Owen, and others equally eminent. As it is I will sum up with one given by the greatest of authorities, Mr. Panizzi himself. Here are the words of that gentleman, in answer to the questions put by a Committee of the House of Commons, and most important they are, when it is remembered that there is no head centre in the present mode of government:—"I think," said Mr. Panizzi, "that it is impossible the Museum can go on without a head. The executive ought to be strengthened by union, not weakened by division." And again, Question 421. "Your great object is then to get some one as Chairman of Trustees responsible for the whole Museum? Mr. Panizzi—Yes." Backed up by such testimony, then, I can have no hesitation in believing that in the interests of the public, some change is required, nor have I much more hesitation as to the nature of the remedy which I should recommend. It is a very simple one, and the same which I ventured to suggest in 1862. I propose to place *all* the national collections under the immediate authority of a minister of the Crown, who shall be directly responsible to Parliament for all that is ill done or left undone, in those collections. At the British Museum I would further adopt the suggestion tendered by several committees for approval, and would abolish the post of Secretary Librarian, and give to the museum, as head, an officer of rank and consideration, with a remuneration worthy of so distinguished a post, and of sufficient magnitude to tempt a distinguished man to accept it. In abolishing the post of Secretary Librarian, I mean to infer no slight to him who has lately retired from that post. On the contrary, I believe Mr. Panizzi to have been the moving spirit, as far as he was able to move at all under the incubus that lay upon him. I think we owe to him a debt of gratitude for the great ability, zeal, tact, and energy, with which he has managed to grease the wheels of the old coach, and screw it along at all for so many years, but that is no reason why we should renew such an anomalous state of things, or impose such incongruous duties on another. Readily do I make allowance at this conjuncture for the *amour propre* of this distinguished conclave of Trustees. As in the case of the new Board to which the government of India has recently been trusted, I have no wish to sweep them away at once, as a consulting body, provided the "Head Centre" authority be invested in the Lord President of the Council or some other Minister of the Crown.

These, then, are the charges which I allege, and here is the solution I should propose for the difficulty. But there is nothing new in them. They are the same charges and the same suggestions that I ventured to lay before Parliament four years ago, and how was I met on that occasion? I am the more anxious to recall the events of that night, because I believe it was the turning point in this question; and while I say thus much, it is, I hope, needless to guard myself from supposing that therein I allude, even in the most remote way, to anything that fell from me. Discontent had slumbered for long, and the spark of that night made it burst into flames. All the great authorities on these and similar questions expressed their opinions. My right honourable friend, Mr. Disraeli, made, as he always does, an admirable speech, containing much that was valuable; but seeing that he has since that time been absorbed into the gulf of irresponsibility at Bloomsbury, I think it more courteous to make no quotations from his words of wisdom—indeed they are not necessary; for on that night the defence of the Trustees of the British Museum was confided to one of the most remarkable men of the day. Mr. Gladstone is certainly the greatest orator of his age, and well do I remember the feelings of pride with which I perceived that the demolition of my remarks was to be entrusted to the hands of so great a master of oratory, and worthy of his fame. Mr. Gladstone soon lashed himself into a fit of eloquent enthusiasm over the sterling merits of the trustee government. I was literally amazed while he proceeded to declare that "the indictment against the British Museum Trustees was fundamentally unjust and incapable of being sustained." Again, he "denied that there was absence of public control in the British Museum management;" and he wound up by "confidentially stating that the control of the Treasury over trustees' estimates is, in the interest of the public, as strong and effective as it is generally over the estimates prepared by the public departments, and stronger than over those prepared by many public departments." This was the hot fit, but, fortunately for that cause the success of which I have at heart, the hot fit began soon to cool, and almost the next sentence was designed to guard the orator from that to which he had just committed himself:—"I am not stating," continued Mr. Gladstone, "that the machinery of this government of the Museum is the machinery that might have been chosen if we had had to construct from the ground again." If the system of government be so perfect, thought I, why not apply it to any new institution to be constructed from the ground? But the next sentence solved my difficulties, for Mr. Gladstone proceeded to say this:—"I also concur in thinking that Boards of Executive, as a general rule, are wrong." By this time I remember that my fear of being demolished had greatly diminished, and was destined to disappear altogether before the concluding sentences of the Chancellor of the Exchequer:—"We must not suppose that I am contending that it may not be desirable that some more direct relationship between the Executive Government and the government of the British Museum might be established. I am one of those who think that the constitution of the administrative body may fairly, at some future period, be submitted to revision and reconsideration. No doubt, if it could have been foreseen in the early days of the museum that it would become an institution, wholly supported by enormous annual grants, its administration by such a government as it has at present would never have been dreamed of."

These are the words uttered by the eloquent champion of the trustee system; but still better, they are the words of him on whom the settlement of this long vexed question now chiefly depends.

I trust the discussion of to-night will be such as to strengthen the hands of the Chancellor of the Exchequer, and nerve him to add this to the many achievements of his political career—the breaking up the antediluvian system of irresponsible boards, and the placing under a responsible Minister of the Crown the control and government of our vast national collections, so that they may be managed in consonance with the wants of the age, and be made as available as possible for the education and recreation of the people, not only of the metropolis, but of the United Kingdom at large.

DISCUSSION.

Professor TENNANT drew attention to the great imperfections in the catalogue of minerals in the British Museum. The collection was probably the finest in the world, but the catalogues were most imperfect. The system pursued at the Museum of Practical Geology in Jermyn-street and in Dublin was greatly superior. At the British Museum the student found himself at sea, but at those other institutions, by means of labels and an excellent hand-book, a great deal could be learnt in a very short time.

Mr. AYRTON, M.P., said that as several pointed allusions had been made to him by the noble lord in his paper, he felt that he ought to make some observations in connection with the subject, which was a most important one. They would all agree in one thing, namely, in expressing their admiration of the great ability which the noble lord had manifested in the paper, in which he had opened up questions of the most comprehensive character. The noble lord was desirous of bringing under public notice one or two leading ideas, the first of which was one of very general interest, and which they could all appreciate, namely, the administration of some of those museums which were called "public museums." He had always felt that the administration of these museums was of a most anomalous and unsatisfactory kind, and the chief defect was not so much in their having boards of trustees, but in so many of the members of those boards being members of both Houses of Parliament. As long as the leading members of the Government and of the Opposition sat side by side on these boards, so long would there be perfect unanimity between them whenever the matter came under the notice of Parliament, and it remained for outsiders in Parliament, such as his noble friend, to bring the subject under the notice and attention of the public. He believed it was to the existence of these boards that we owed the apathy of public opinion and of the House of Commons with regard to the management of these institutions; for he was quite sure that if the boards were composed of scientific instead of political men there would be a very different view taken in both Houses of Parliament of the management of such institutions. The most important part of the conduct of these institutions devolved on men who were entirely unknown, because they were covered by the great array of names, and the most important steps were taken by persons of whom they heard the least. The result of this, of course, was most unsatisfactory. They had been struggling for years against this system of management, and he thought the whole thing was not inaptly summed up by Mr. Panizzi, when he said, in answer to a question put to him in a committee of the House of Commons, "Ours is an old institution, well-established, and Kensington is a young rival endeavouring to push itself into notoriety." This was the truth of the whole matter, and the answer to every suggestion to give life, and force, and usefulness to the British Museum was, that it was an "old-established institution," and required no effort to keep it in existence, and to secure its large parliamentary grant. At Kensington they always found life, and improvement, and animation, and new efforts were constantly being made to meet what were supposed to be the public wants, and to extend the usefulness of the institution, the reason of this being that it had not yet established itself in public opinion, but had to earn a reputation and a character for itself in the eyes of the public. This caused a great difference in the management, and it had taught a great many useful truths which never could have been learned from the management of the British Museum. At Kensington they had solved the question of the usefulness of opening such places in the evening, and it was found that by far the greatest number of visitors to that museum came in the evening. To Kensington, they were indebted for another discovery on a matter which was one of great difficulty with the trustees of the British Museum. It had been said that it was utterly impossible to take anything out of the British Museum when once it had g into it, but Mr. Cole and the managers at Kensing had made the useful discovery that objects need not locked up in metropolitan museums where people in t country could not get to see them, but that they co be taken to the cities and towns where those people liv These were the characteristics of the administration, a his noble friend had suggested that as so excellent a sult had been obtained from official administration Kensington, responsible to the Crown, and through Crown, to Parliament and people, the same system sho be adopted at all exhibitions, and all museums and lections should be placed under a similar administrat Undoubtedly there was always wisdom in being gui by experience, and were their attention confined to simple proposition that the plan which had been adop so successfully in one instititution should be applied to similar institutions, there would be no difficulty in ass ing to it, but there were a great many difficulties be an abstract proposition could be adopted as a right p ciple to act upon. In this country they always ha deal with that which had grown up in course of t He did not think, however, that it would be profit to discuss those difficulties there, because they belong to the official functions of the executive of the country while the political difficulties hardly belonged to th region of science and art, which did not concern its with politics. It would also be extremely difficult t discuss the general question of what constituted museum. It must be recollected what a very compre hensive subject that of museums was. He ventured to say that if he asked every gentleman in the room what a "mu seum" was, no two of them would give the same answer They would all agree in saying that it meant the gather ing together of a number of things, but there were ver few who would be able to tell the purpose for which these things were gathered, or what must be done with them. He recollected a number of men of known repu tation in science and art coming before a Committee o the House of Commons in connection with the Museu of Patents, and they thought they had disposed of th question, by merely using that term, but when the were asked to give an idea of what they meant by museum, there was not one of them successful in h definition. Of course the difficulty of the subject w greatly increased by this. Some one had proposed th a museum of natural history should contain specimens all the works of creation, but this involved such a com prehensive notion that it would give rise to a gre controversy, and two schools of thinkers on the matt had been started. If a man were shown specimens all the works of creation, he would probably lea nothing at all; so numerous were the examples to studied. Another school started in antagonism, a proposed to have what was called "an exhibition types" of every class, so that the visitor might be a to see creation in its general aspects, and to comprehe what he saw. But the consequence to which this g rise was that Professor Owen had proposed a muse which would cover ten acres! That was what he sta before the House of Commons, and since then it gone under the name of the "ten-acre museum." O imagine a person wanting to visit a museum having go over ten acres! In dealing, therefore, with the s ject of museums there were many difficulties to be c tended against. It became necessary to consider, fi what a museum was, and secondly, what were the p poses for which it would be used. They had not night arrived at a comprehension of these questions, they would see at once the difficulty there was in do so. The noble lord had spoken in his paper of "e cational museums," but he (Mr. Ayrton) was very m struck with the different senses in which the noble l even with all his accuracy, imperceptibly used the w "education." There were many kinds of educatio even in reference to museums. There was, for insta the education of the people who visited museums,

there was, also, the education of persons who were studying the particular subjects that the museum was intended to illustrate. The education in the one case was very different from that in the other, and a museum that would be valuable in the one would not be of much use in the other. To illustrate what he meant, he would say that in the British Museum there was a vast number of specimens of natural history locked up in drawers which nobody ever saw, and people might ask the use of having them, but the fact was that they were intended for education of the highest order, viz., of those who were pursuing the highest branches of knowledge, and who would thus have an opportunity of presenting the results of their studies and researches in a popular and intelligible form. The same point was illustrated in the library of the British Museum. Mr. Panizzi had been blamed by some people for requiring a copy not only of every work published, but of every edition of every work. There was, however, an important object in view in this, and that was to make a perfect collection in which men of letters could find materials and resources which they could not possibly get elsewhere. A man often wanted to trace the development of an idea in successive editions of an author, and, thanks to Mr. Panizzi, he was enabled to do it at the British Museum, though he could do it nowhere else. He had said enough to show how large the subject was, and he felt that his noble friend deserved the greatest credit for the attention and ability he had bestowed upon it, and he hoped that, by his persistent attacks on the Trustees of the British Museum and other similar institutions, a better administration would be arrived at, and the national collections be made equally available for the highest and humblest reach of intellect to be found among the people.

Mr. Harry Chester was anxious that some practical result should be arrived at. The subject which had been brought before them was a very extensive one, and parts of it could not very well be dealt with by the Society. The views of the noble lord relating to the Trustees of the British Museum and the National Gallery, for instance, could not be pressed far enough to be of any use without coming into collision with those bodies. But when the noble lord asked for more museums, and to have them lighted and opened in the evening, such matters were quite within the scope of the Society. He trusted the Council would think fit to appoint a committee to deal with the subject, and if the noble lord would undertake to occupy the chair his services would, no doubt, be very useful. Much stress had been laid on South Kensington, but that was only a young institution. In all institutions of that kind it was the man who did the work, and if Mr. Cole were succeeded by an obstructive the system would not be found the best in the world.

The Chairman said he took great interest in this question, and in making the remarks which he intended to offer, he wished it to be distinctly understood that he spoke as an individual only, and not at all on the part of the Government. He was merely going to repeat what he had often said, both in the House of Commons and on several other occasions. He did not agree with Mr. Chester that they should discard from their attention the subject of management. The great question was based on management, and until that was improved the British Museum could not be turned to the greatest possible public advantage. He did not wish to speak disrespectfully of the Trustees of the British Museum as individuals; many of them were his personal friends, men of great attainments and holding high rank in the country, both in social and scientific circles, but he spoke of the system, and the very fact that a system which was identified with such names as Mr. Grote and Mr. Lowe had broken down, proved to him that it ought fairly to be assumed to be a bad one. He believed the present management of the British Museum to be wrong in theory, and wrong in practice, and that it would never succeed. No doubt it was the spirit of the day to have affairs managed by Boards; but there was no analogy between Boards which were elective, paid for their work, and responsible to shareholders, and the Trustees of the British Museum and the National Gallery, who were not responsible to the public. It was an anomaly that the administration of so large a sum of public money—above £100,000—should be in the hands of those not responsible to Parliament, and that the vote for the British Museum and National Gallery should be moved by an independent member. There ought to be a member of the Government responsible to Parliament for all public museums, libraries, and collections belonging to the country. As regarded the British Museum, the administration by trustees had been to a certain extent successful, because they had had a very remarkable man as secretary, Mr. Panizzi—a man of great ability, extensive knowledge, great social position, and, more than all, indomitable will and firmness. It would be very difficult indeed to replace him. In many parts of the museum, however, the arrangement was very imperfect. He might instance the collections brought over by Sir Charles Fellowes, which although belonging to periods of art extending over several centuries, were huddled together without any chronological arrangement. With regard to the opening such institutions at night, Mr. Ayrton had on one occasion stated that the desire for this prevailed to a great extent among the working classes of the metropolis, but, for his own part, he very much doubted if such were the case. He himself belonged to a society of working men, who held meetings once a month, and during last autumn he brought forward for discussion this very question as to whether museums should be opened at night. He put it to the meeting to which he was referring whether it would be a right thing to call upon the Government to expose valuable objects of art, for which they were trustees for the human race for all time, and which, if destroyed, could never be replaced, to the risk of destruction by fire. Mr. Braidwood had stated that the British Museum would not be safe from fire if lighted by gas; and it must be recollected that the trustees had the collection in charge for the use of mankind, and of civilisation at large. The working men present at the meeting he referred to said they had never seen the subject before in that light, and he succeeded in carrying a resolution against the museums being opened at night. They took the same view of carrying valuable works of art about the country; and agreed that it would be unwise and wrong on the part of the Government to expose them to any risk of destruction. Of course it was a very important question as to whether buildings could be constructed which would be safe from fire, but this had nothing to do with the present British Museum, which was not built with any view of being lighted, and therefore could not be used in that way. To show still further the anomaly which existed he would mention that though the National Gallery was liable any day to be burned down, yet the ground floor of it was allowed to be occupied by the keeper, his wife, and family. Surely this would not be allowed under a better state of management than the present. He quite agreed that something ought to be done to enlarge the utility of the British Museum, and he thought the noble lord's paper had been brought forward at a very opportune moment. The offices of librarian of the British Museum and director of the National Gallery were both vacant, and it was probable that the subject would soon be brought under the notice of the Government, and that some practical measures would be adopted which would regulate the whole. In this connection the paper and the discussion would prove to be most useful, not only to the Government but in guiding public opinion, and thus would not be in vain. He did not think there would be one dissentient voice when he proposed a vote of thanks to his noble friend for his very able paper.

This was carried unanimously and was duly acknowledged.

THE CATTLE PLAGUE IN THE LAST CENTURY.

The following is a reprint of the article* on this subject referred to in the chairman's address at the opening of this session:—

(Continued from Page 161.)

This investigation of the progress and manner of action of the contagion, according to the state of the subject in the murrain, affords a clear view of the indications of cure. It is evident that the struggle here betwixt health and the disease lies, in fact at first, betwixt the vital ferments which support the animal economy and a preternatural ferment which tends to destroy them, and that consequently, if the latter prevail, it introduces the putrid ferment to which all animal substances have a disposition when it is not controlled by the vital. It is certain, also, that the vital ferments depend on the due commixture of the several humours and their constituent parts by the circulative motion of the blood, and those other motions of the animal juices which are performed by nervous action, and that these motions are more or less strong in proportion to the nervous strength of the subject, or, in other words, that they are rendered vigorous or languid as that strength is augmented or diminished. Whatever, therefore, increases this nervous strength or gives tension to the fibres, increases those motions, and whatever adds to the force of those motions proportionately increases the vital ferments, and consequently resists the action of the contagion, which cannot take place while they maintain themselves in their due power. Hence it follows that the way to assist nature against the attacks of this disease is to keep up the animal strength by such invigorative means as are compatible in other respects with the salutary economy.†

To invigorate and strengthen by the administration of such medicines as give force to the action of the nerves and tension to the fibres is the principle absolute intention of cure, which is dictated by the general nature of the contagion and its mode of operation. But there is, moreover, a palliative or secondary intention, which arises from the consideration of a peculiar symptom. It appears from what is above laid down, that the state of the parts subservient to digestion denies the performance of that office on such food as requires the aid of saliva and of lymphous juices secreted in the stomach, whence the power of the contagion is increased by the weakness resulting from the inanition, and the depravity of the humours in consequence of the want of a supply of fresh chyle to the blood. It is, therefore, a just subservient intention to furnish a proper quantity of such food, of a fluid consistence or divided texture, as can be digested under these circumstances, and thence to support the strength of the subject, which must, otherwise, sink from the concurrence of this additional cause of weakness with the effects of the contagion and putrescence.

The primary intention of cure in the murrain, according to these principles, is to be executed by the administration of such corroborative and cordial medicines as give due tension to the fibres and vigour to the nerves, removing the spasmodic insensibility or impediments to their action, or their too great irritability, whence an irregular mode of action is produced.

There are various kinds of medicaments which have these powers. But experience in the case of similar diseases, and the consideration of general fitness to the peculiar circumstances of this, point out two species, which are more peculiarly proper as well as efficacious. These medicaments are the astringent, febrifuge, gummous parts of vegetables, and vinous liquors.

It is found that various vegetable substances containing the astringent gums, and bitter juices, which possess the property of tanning leather, have the quality of bracing the fibres in the living animal, assisting to the due tone of the nerves, and thence checking the putrescence which would otherwise prevail in consequence of a certain degree of weakness.*

The Peruvian bark is the principal simple of this kind which has been hitherto used, and experience has not yet evinced any other to be in all respects an equal substitute for it. The efficacy of this drug in intermitting fevers has been long known, and, more lately, its utility in some contagious disorders, and all others where the weakness and relaxation of the fibres aggravate the effects, is equally ascertained. Nor are there wanting sufficient trials, as was above intimated, to show that, what might be well presumed from analogy, holds good in observation on facts, as to its availing in like manner in the murrain, though it has never, as far as appears from any reports made to the public, been used with those advantages as to the collateral circumstances which would most have contributed to render it effectual.

There is, nevertheless, a great obstacle to the giving the Peruvian bark alone to the cattle in such quantities as might be requisite in the murrain. This is the high price of it, which would render the administering it, for

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* The paper is entitled "Observations on the Murrain or Pestilential Disease of Neat Cattle: the Means of Preventing the Infection, and the Medicinal Treatment of the Beasts when seized with it," and is by Mr. Robert Dossie. It is extracted from his "Memoirs of Agriculture," Vol. ii., 1771.—Ed. *J.S.A.*

† The same intention of cure, as is here proposed for the murrain, is now pursued by all able physicians in the contagious and other diseases of mankind that induce a putrescence, experience having shown that it is the only means which avail in such cases. It is, therefore, demonstrated to be the proper method of treatment of cattle in the murrain, not only by reasons deduced from the symptoms of the disease and the observations of the cause why amongst the cattle left to nature some escape and others are carried off, but also from analogy on comparison with the facts respecting similar diseases.

* It is to the effects of the peculiar kind of astringency of the bark, wood, or other parts of vegetables which possess the tanning property in giving due tension to the solids, and thence producing the due motion of the fluids, as above-mentioned, that their power of resisting putrescence in living bodies must be ascribed, and not, as was before observed, to any immediate action on the juices themselves by which that disposition is checked, as would happen on the mixture of the same fluids in a proper proportion out of the body. The proportion of the quantity given medicinally compared to the whole mass of fluids on which it is supposed to act is far insufficient to produce such an effect, as may easily be ascertained by experiment of the effect on the commixture of proportionable quantities of the same substances out of the body. The observation that such substances had the property of checking the putrefaction of animal substances out of the living body, to which the name of antiseptic has been given, has occasioned, nevertheless, the accounting, by a precipitate judgment from it, for the effects of those substances in the living body without a due regard to the proportion of quantity, or attention to the real cause of the suspension of the putrescent action in the parts of animals while alive. The mistake of this principle has not only occasioned erroneous speculations but wrong practice in medicine, a very material instance of which has been the adding other substances, deemed also antiseptic, to aid the astringent vegetables, which has been practised, as well in the attempts to cure the murrain as in other cases. For several of the substances ranked in this class have a tendency to weaken the subject, and consequently to promote instead of counteract putrescence. The vitriolic acid in its simple state, or prepared in the form called elixir of vitriol, has been most commonly joined to the Peruvian bark in this view, and rendered it much less effectual, as may be well concluded from the injurious effects it has on digestion when weak, and its power of diminishing irritability, both which are very opposite to the intention in which the bark is given. The physicians who had, by his writing, most propagated this notion and use of antiseptics, is now convinced, by more mature experience, of the faultiness of such practice, and candidly acknowledges his disapprobation of joining the vitriolic acid to the bark in low and weak habits.

the time and in the quantities necessary, a considerable expense, and it is absolutely requisite to the using any remedies in this disease with benefit to the proprietors of the cattle, that their cost on the whole should be moderate. It has, therefore, with great reason, been thought expedient to spare a part of the bark, and substitute for such part some other cheaper simple more allied to it in its properties. The white willow bark has been selected by some for this purpose, and has, indeed, the tanning property in a considerable degree, but there are other simples which have that in a still greater, and also possess at the same time additional qualities which materially conduce to the invigorating effects. The tormentil root is peculiarly adapted to this intention, as it has not only the due astringency, but the warming and cordial properties of bitters and aromatics, whence it may check the profuse diarrhoea, which, when it comes in the early period of the disease so frequently carries off the beasts by exhausting their strength before nature can perfect a mature crisis. This simple may, moreover, be easily obtained even at the slightest expense, being one of the most common and general of the herbs which grow wild in these parts of Europe. It may therefore be well substituted for at least one-half of the bark where no early purging comes on, and for three-parts in four where it does, as the quantity of it may then be increased with advantage. It may be proper likewise to add a proportion of some warm aromatic simple of the kind called carminative, and the carroway seed is extremely well suited in all its qualities to that purpose. This will invigorate the action of the stomachs, which appears evidently languid, the stomachs themselves, as was above observed, participating of the paralysis of the upper parts.

By vinous liquors, which are the other species of invigorating medicines proper in the murrain, is meant any kind of fermented liquors that contain vinous spirits. The late-acquired knowledge of the efficacy of this kind of remedy in contagious and other fevers where putrescence prevails has furnished the means of aiding nature to resist such diseases when the natural strength could not otherwise support the vital economy against the effects of them. The giving wine in our country to the beasts in the murrain would, however, be impracticable on account of the expense, and perhaps good fermented malt liquor is better adapted, on the whole, to the intention than wine. A proper quantity therefore of ale that is not too new, or of that kind of malt liquor called strong beer, should be given twice a day, and to render it more cordial where greater symptoms of weakness appear, a proportion of some distilled spirit should be added to it. The kind called geneva is the most cheap and easily obtained, and the ingredient, besides the vinous spirit, being terebinthinate essential oils, are by no means improper in this case.

The secondary intention of cure above-mentioned by the supply of diet suitable to the disordered state of the digestive faculty in the murrain may be thus provided for:—The beasts may be fed on hay, so long as it appears to agree with them. Though, as there is always a defect of the saliva, and the lymphous juices of the stomach, as well as a consequential weakness in the digestive ferment, it may be proper to mix some proportion of green herbage with the dry fodder. But when the hay or herbage cannot any longer be digested, as will be indicated by the beasts' refusal of it, and their ceasing to chew the cud, it will be requisite to have recourse to such other food, as is either fluid, and consequently does not demand the dilution of the saliva and lymph, or such as is of so divided a texture and so yielding to maceration that it may not need the strong action of a digestive ferment to its resolution, or reduction to that state of chyme which fits it to pass into the smaller intestines. Milk is the most nutritive of any fluid which can be administered in this case, and, if its coagulation be prevented by the addition of alkalies to counteract any accidental acid in the other stomachs that might otherwise have that effect, it will of course pass forward to the curd-bag, which, from its emptiness in the dead beasts, appears not to have lost its action as the higher stomachs, but to propel duly the chyme or digesting matter into the lower guts. In order to make a saving in the quantity of the milk which, if used alone, would be considerable, it may be expedient to add some water and a proportion of solid food of the nature above prescribed. The most fit kind of such solid food is corn in a farinous state that is reduced to meal, which may be of any sort that is cheapest and most conveniently to be obtained. This will be macerated so as to mix with the fluid given with it if the digestive ferment be ever so weak, and will pass with it forward into the small guts, if the action of the stomachs be ever so slight. By these means proper alimentary matter will be conveyed into the lower intestines and there digested, as they and the curd-bag are not, at least in the earlier stages of the disease, so disordered and rendered incapable of their office as the three upper stomachs, the default of the action of which will, nevertheless, in this method be made of much less consequence.

The nutrition of the beasts in the latter stage of the murrain will be thus provided for, notwithstanding the impediments which the effects of that disease otherwise produce to digestion, and the inanition thence resulting, which conspires powerfully with the other causes of weakness and putrescence to render the disease fatal, will be, in a considerable degree, prevented.

The alkalies, which may be used to hinder the coagulation of the milk given as food to beasts in the murrain, may be a small proportion of soap or chalk.* The latter of these may be used more copiously where a looseness comes on too early or too profusely, as it will check such an evacuation without the danger of stopping it in case it be critical.

By a proper use of these medicines and regimen it may be presumed, on the justest ground of trial and observation, as well as of speculative reasons, that a considerable number of the cattle, which would die of the murrain if left to the natural course of the disease, would be saved. It is not to be imagined, nevertheless, with the least shadow of reason, that there is any method of cure which would avail in every instance, the very weak or disordered habit of part of the beasts subjecting them to the violence of the distemper in a degree beyond the power of those practicable means that can support their strength. But if such a number be preserved from destruction as overbalances, on the whole, in any material proportion,† the expense of the treatment of the cattle

* The use of alkalies has been exploded by some eminent writers in all cases where a putrescent disposition prevails from the notion of their promoting it, and some of the most sensible of those who have treated of the murrain have adopted the same opinion. But this objection to alkalies is not justly founded, as they have not, when taken in moderate quantities, such an effect in the habit. The proportion of them given medicinally is far too small to have any immediate action of this kind on the whole mass of fluids, and in their consequence, from the operation they may have in the intestines, they produce often the contrary effect. For by destroying the acescent ferment which prevails in cases of weak and disordered digestion, they promote the proper digestive ferment, and prevent that increase of debility and general injury to the habit which the faulty digestion would produce. It may seem a paradox according to the effects of experiments made on the relative substances out of the body, but it is, nevertheless, absolutely true that alkalies check also the putrid ferment of the digesting matter in the intestines, as is plainly evinced by their removing almost constantly that species of heart-burn which arises from the putrescence of animal food in weak and depraved stomachs.

† On a modern computation the treatment of a beast conformably to the means of cure above-recommended would not, on an average, cost the owners of cattle above eight shillings in the course of the disease. So that if according to the principles above-premised in the note, p. 423, it were necessary to practise it on four beasts in order to save one,

by the method proposed the proprietors will find an adequate inducement to put it in practice, and the public will in several different manners reap great advantage from it if extensively adopted.

I have for more than one reason omitted, at present, the giving formal prescription for the medicines or rules for the regimen, as there will be a more proper season for it if the occasion for the practice of them should ever again occur in our country. The knowledge of the symptoms and appearances by which the disease may be distinguished are alone all that is necessary to be generally taught now, but that knowledge certainly ought to be diffused as universally as possible. The explaining at this time a method of medicinal treatment, in such a way as to render it easily practicable by the common owners of cattle, would be rather injurious than beneficial in its effects to the public. What constitutes the great object of care and attention at present is the excluding the contagion from our country by the immediate slaughter of the beasts infected or exposed to the hazard of being so, and not the attempt of cure.* Reason and the legislature both decree that measure; and in order that what is ordained by authority respecting this slaughter, and the other regulations for the keeping out and stopping the progress of the infection, may be rendered more effectual, I shall here subjoin a few hints relative to some defects and errors in the present plan of measures which, as they now stand, may prevent its being effectual to the purpose.

The first and greatest defect attending what is ordained by the government for the suppressing the contagion of the murrain in case it should be brought hither again, is the general want of due knowledge for discovering the disease early on its first breaking out, or distinguishing it with some degree of certainty in each particular beast from other disorders incident to cattle. It is in vain that private persons should be enjoined by the government to destroy their cattle and magistrates to compel them to it, and return them a satisfaction, provisionally the infection be actually in the place, if they be wholly ignorant of any certain signs by which they can distinguish it. Yet this is almost universally the case at present, there being scarcely any but persons applying to medical speculations, and some few others, who may remember what they observed during the time of its prevailing here formerly, that are in the least acquainted with the nature of the disease or its appearance. Moreover, the far greatest part of those who may be desirous of acquiring a due information in this matter are almost entirely destitute of the means, as there is no method generally known of gaining any satisfactory intelligence relating to it, and such lights as might be obtained, if the means were better known, could not be procured occasionally in case of an alarm in any particular quarter before the opportunity of their being serviceable was over, and either the contagion, if it had been really brought, was progagated too widely to admit of a suppressive remedy or a needless expense incurred by the neighbourhood if any other disorder of the suspected beasts had been mistaken for it. Many important acts are by the late statute required to be done by the magistrates, inspectors, &c., conditionally that they shall believe the distemper be in any suspected place, or within a certain distance of it. But on what shall they ground such a belief on a subject of which they have no means of judging? or who shall be qualified to

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the actual expense incurred for each beasts so saved would not amount to above thirty-two shillings, which is not more than one-third of the price of neat cattle, taken one with another, at a time when the disease prevails. But the advantage to the public would be in much greater proportion than merely this gain, from the effect the saving one-half the beasts that otherwise would die would have in keeping up the national stock, and preventing the scarcity from becoming greater, the mischiefs of which, when it goes beyond a certain degree, augments in much larger than an equal proportion to the scarcity itself. To the proprietors of cattle, moreover, the advantage of every beast so saved would be far beyond the common price of one in other respects equal. For after the disease has had some duration in any place the value of the cattle which have had it rises very considerably on account of their future security from the infection. In the latter part of the time when it last raged here a cow, which could be well certified to have had it, was deemed to be worth sixteen pounds, near London, and the same holds good now, as to the price of such a cow in Holland. This circumstance not only yields an additional motive to the proprietors of cattle to pursue an efficacious method of cure, but it is pregnant with great advantages to the community, as the recovered cows must here, where a fresh supply cannot be had by land, as on the Continent, make the principal dependance for breeding to keep up the stock and for obtaining milk.

* As the means which ought to be pursued for the national security, according to the present circumstances, in case the murrain should break out anywhere with us again, are the killing immediately the cattle infected, and the preventing the removal of those exposed to be so, or of anything that can convey the contagion, the publishing at present directions for the cure of the cattle in so explicit and familiar a manner as might be easily put in practice by the common owners of them, would probably have injurious consequences to the public, as it might produce motives to neglect destroying the beasts under the hope of saving them by cure. It is, therefore, more proper while the disease is confined to one spot only, or to a few with narrow limits, to furnish every assistance to the quick and certain discovery of the disease if it should be brought over to us, in order to suppress it instantly by those means which are ordained by law than to encourage any endeavours to save such beasts as are infested with it. If after these means of extirpating the contagion have been duly tried, they should be found to have failed of success, so that the infection has been spread over a large extent or diffused into a great number of places, as happened in the former invasion of our country by it, the case would be quite altered, and the supplying then as extensively as possible the best means of saving the cattle by medicinal aid, would be a great benefit to the public, because the destroying them under those circumstances would be very detrimental instead of advantageous, as it could not possibly produce the intended effect, but would co-operate with the disease itself in causing a scarcity of cattle. The continuance of the orders for destroying the cattle after the murrain was extensively spread over the country had a very apparent bad effect the last time it raged here. The visible constant decrease of the cattle as well from the number slaughtered as from those which died of the distemper, the great room which it was found the bounty offered at large gave for impositions and frauds, and the heavy expense on the public in providing for the bounty, afforded therefore the strongest reasons for retracting the orders for killing the cattle. This instance, as well as obvious deductions from the subject itself, evinces it is only when the murrain first breaks out, and the infection is confined to narrow bounds, that the means and regulations at present provisionally ordained by Act of Parliament can possibly avail and be proper. For afterwards the killing those beasts which might otherwise recover would be a palpable loss, not only of so many cattle, but of those that, as we have seen before, are, from their future security against the infection, of far greater value than others, and the restrictions with regard to the driving and removing the cattle, the prohibitions of fairs and markets for the sale of them, &c., would cause such a defect in the supply of the capital city as would be attended with very embarrassing and distressful circumstances. There is another reason why I have deferred giving a formal description for the medicinal treatment of the cattle. It is that though I am convinced from trial and observation the practice recommended is good in a general view, and I could point rules for the conducting the particulars which would be efficacious, yet there are several circumstances with respect to which it is not hitherto ascertained by a sufficient field of experience what precise degree or mode would be most effectual and best. Proper measures are therefore taking for having such trials made in Holland, where a too fair opportunity is at present afforded, and the result of them when they are completed will afford the means to lay down hereafter with more certainty those rules and directions as to each particular, which may be most effectual with regard to the cure, and advantageous with regard to the expense. In the mean time the generals here presented may enable any person versed in medicinal subjects to give direction for the putting the cattle under the due regimen if a just occasion should demand it.

certify sufficient matter of evidence to them when everybody around them are equally in the dark with themselves as to those principles which furnish such means? This seems to be a difficulty in the due execution of the orders of council for destroying the suspected cattle, and laying restrictions on the removal of those probably exposed to the contagion which renders their operation extremely uncertain, and may cause great inconveniences from conscientious and zealous attempts to enforce them where the facts on which the right determination of measures wholly depends are so easily to be mistaken. The method to remove this difficulty is suggested by the very nature of the subject itself. It is obviously the providing the proper means of information of the characteristic signs of this disease, and circulating the intelligence of them as generally as of the orders of council themselves, in the doing which the following manner seems most easy and effectual according to the present state of things:—

A brief account of the most discernible and peculiar symptoms of the disease and of the appearances in the inward parts of the beasts which die of it should be procured. This account should be drawn up in the most clear and simple manner, and expressed in the most clear and simple language, divested of all terms of art, and accommodated to persons of ordinary capacity. It should then be transmitted to every parish, and disposed of there in such manner that all the inhabitants may be apprized of, and have easy means of recourse to it whenever they may have occasion, and more particularly those who are officially concerned in the execution of the orders of council. In order to do this most conveniently it may be proper to follow in some measure the same method which is taken to promulgate the late Act of Parliament and the orders of council. It is ordained by that Act, a printed copy of the same, together with any orders of council made in pursuance of it, shall be provided by the churchwardens, &c. of every parish with intent that they may be read by the minister the next Sunday after the receipt of them, and afterwards on one such Sunday in every calendar month as he shall think proper; and also that they may be kept by him in order to his permitting every person residing in his parish to read the same during the time the respective orders of council may be in force. Now it would be expedient to join a printed copy of the account of the signs of the disease with those of the Act of Parliament and orders of council, that it may be always ready to be consulted along with them, or separately, by all persons who may have any need of such information.

It would likewise be very expedient, in order to the rendering more general a due knowledge of this disease, to have a copy of the account of the signs of it being printed on an open sheet of paper, hung up in a proper frame in the market-house, town-house, or any other public building in each parish, where the people may constantly have recourse to it, without troubling the minister, which would induce them to take more readily the pains to obtain the requisite information from it. Another copy should be always in the possession of every magistrate, inspector, or other person who has any official concern in the execution of the orders of council, that they may have the necessary means at hand of enabling them to judge how far, in any suspicious case, there is just ground to conclude the actual presence of the disease.

As the greater or less success of the injunctions or regulations ordained by the Government for the preventing the bringing into our country the contagion of the murrain, or for suppressing it if brought, depends on their being more or less generally known, it seems that the present means of publication of them are defective, as it is certain that by such means only a small part of those, whose conformity to them is requisite to the end, can be possibly thence apprized of them. A proclamation of all orders of council respecting the disease is inserted in the *Gazette;* and the last Act of Parliament directs them, as above-mentioned, to be read one Sunday of every month in the parish church, or other place of public devotion. But few of the common people, and perhaps even the magistrates, &c., constantly read the *Gazette* in the country; and there are many parishes into which it never comes at all. Numbers of persons, being of other sects of religion, do not go to the parish church at any time; and others are very liable to be absent on the particular days when these orders are read. The churchwardens or other officers, moreover, who are to provide the copies of them, not having an opportunity of seeing the proclamations in the *Gazette*, are sometimes entirely uninformed of them, and therefore do not provide the printed copies of them as directed. For these and other reasons the reading them duly in the church is often neglected, and consequently the whole or a great number in every parish are left ignorant of what is ordained. It is necessary hence that some more effectual method of publishing the contents of the proclamation should be pursued; and it would be, therefore, right that the contents of them should be printed in the manner before proposed for the account of the signs of the disease, and hung up with it in the most public place in every parish, which could not fail to make them much more generally and perfectly known than they can be at present. This should be, under the circumstances now subsisting, particularly attended to with regard to the seaports, and parishes adjacent to them, of the eastern and southern coasts of the island, where the danger is by far the greatest of the distemper's being now conveyed to us from the shores of the opposite countries, where it rages with great violence. To obtain the greatest security it would be expedient that the printed copies of both these kinds should be actually sent to every such parish to be disposed of as above advised, and the procurement of them not solely entrusted to the churchwardens, by whose ignorance of the proclamations, or inadvertence, it will be frequently omitted. Or at least, notices of the orders of council, &c., and the injunctions on the churchwardens to procure them on each occasion, should be advertised in all the principal newspapers, as well in town as country. In order that the whole of this should be duly executed, it seems further requisite that some proper officer should be appointed by the crown to take the charge of doing it on him, and to see that what is ordained may be duly complied with.

Some measures of the kind here pointed out are indispensibly necessary to give us any hopes of the good effects of the ordinances of the late Acts of Parliament respecting the prevention of the murrain, which can yield but little safety from it unless generally complied with. For, if from want of due conformity to them, the disease should find its way into this island in any one place, and spread itself thence widely to others, as may in such case quickly happen, it will not be of the least avail that the strictest observance of them has been practised in a thousand others, since the dreaded mischief may as well diffuse itself with all its calamitous consequences over the whole of our country from one single original source as from any multiplicity whatever.

(*To be continued.*)

Notes.

Second Working Men's Industrial Exhibition in Vienna.—The following communication has been received from Dr. Carl Helm, to whose exertions the successful introduction of working men's exhibitions in Austria is mainly due:—"The favourable result of the first Working Men's Industrial Exhibition, held at Vienna in 1865, induces the committee, with the sanction of the Imperial and Royal Board of Trade given on the 1st December, 1865, to organise a second similar exhibition, to be held on the premises of the Imperial

and Royal Horticultural Society, near the public park, in the month of August and September of the present year, 1866." Programmes of the proposed exhibition (in German) may be had on application to the Secretary of the Society of Arts, John-street, Adelphi, W.C.

Correspondence.

Telegraphic Insulators.—Sir,—I see by the last *Journal* that Capt. Selwyn, in the discussion that took place on Mr. Bain's paper on "Automatic Telegraphy," is reported to have said that when paraffin compound "was vulcanized by the cold process it resisted a temperature of 600°." This, of course, is not the case, and Capt. Selwyn has unwittingly made a serious mistake. In a discussion that took place at the rooms of your Society I stated that the degree of heat wires insulated with collodion and paraffin compound could resist was from 200° to 300° From the numerous enquiries I have received, with a view to the adoption of paraffin compound for insulating underground wires in consequence of the recent disasters that have occurred to the "pole system," it is desirable for me that this mistake should be corrected, as it much misleads, and I would accordingly be obliged if you could insert this letter in your *Journal*.—I am, &c., John Macintosh.

10, Strand, London, W.C., 22nd January, 1866.

MEETINGS FOR THE ENSUING WEEK.

Mon......British Architects, 8.
Actuaries, 7. Mr. T. B. Sprague, "On the Limitation of Risks."
Asiatic, 3.
Medical, 8½. Dr. Anstie. Lettsomian Lecture.
R. United Service Inst., 8½. Mr. Evan Hopkins, "The Terrestrial Magnetism as applied to the Compasses of Iron Ships; the deviation and its remedies."
Society of Arts, 8. Cantor Lecture. Mr. Fleeming Jenkin, F.R.S., "On Submarine Telegraphy." (Lecture I.)
Tues... Civil Engineers, 8. 1. Mr. W. H. Mills, "The Craigellachie Viaduct." 2. Mr. W. Ridley, "The Grand River Viaduct, Mauritius Railway."
Royal Inst., 3. Professor Tyndall, "On Heat."
Wed.....Society of Arts, 8. Mr. Thomas Beggs, "On Dwellings for the People; how to Multiply and how to Improve Them."
Thurs...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. St. George J. Mivart, "On some Points in the Anatomy of the Echidna."
Chemical, 8. Dr. Gilbert, "Utilisation of Town Sewage."
Royal Society Club, 6.
Royal Inst., 3. Prof. Tyndall, "On Heat."
Artists and Amateurs, 8.
Fri.......Philological, 8.
Royal Inst., 8. Earl Stanhope, F.R.S., "On the Influence of Arabic Philosophy in Mediæval Europe."
Archæological Inst., 4.
R. United Service Inst., 3. Captain H. W. Tyler, R.E., "The Routes of Communication with India."
Sat ......Royal Inst., 3. Prof. Westmacott, R.A., "On Art Education."

Patents.

From Commissioners of Patents' Journal, January 19th.

Grants of Provisional Protection.

Acetate of lead—3368—R. A. Brooman.
Apparatus for lubricating purposes—49—W. G. Beattie.
Atmospheric buffing apparatus—2820—T. Williams.
Carriages, hoods, aprons, and dashes of—3150—G. F. Russell.
Charcoal, revivifying—3372—W. Cormack.
Cigars, igniting—3360—C. L. W. Kneller.
Collars—53—T. J. Clanchy.
Copper-plate presses—51—H. H. Collins.
Deodorizing and disinfecting, compounds for—3355—E. V. Gardner, and L. A. and H. A. Israel.
Distillation—31—W. E. Newton.
Electric conductors insulated with india rubber—3347—H. A. Silver.
Feet, warming—41—J. F. Wheeler.
Fibrous materials, preparing, &c.—19—J. Pilling and R. Scaife.
Finger nails, cutting and cleaning—8—C. Schwartz.
Fire-arms, breech-loading, and cartridges for same—3348—W. C. Dodge.
Fire-arms, breech-loading, and rotating breech cylinder pistols, and cartridges used therewith—3258—A. V. Newton.
Fire-works, non-explosible—3369—E. Oppenheim.
Floor cloths—3370—J. H. Kidd and J. C. Mather.
Floors, coverings for—3384—J. H. Johnson.
Flouring mills, feeding meal to the bolting reel in—3385—W. F. Cochrane.
Fuel, combustion of—29—J. Hiscocks.
Furniture, house and shop—3364—D. Vogl.
Gases, passage of—15—R. A. Brooman.
Goods, raising, &c.—71—W. A. Turner and T. T. Coughin.
Grain, mills for grinding—37—J. and S. Jackson.
Guns and gun carriages—43—H. D. P. Cunningham.
Hats—10—M. Montagu.
Hats, ventilators and mirrors for—2—J. B. Croxall.
Heavy bodies, safety net to arrest the fall of—2969—L. E. Laurency.
Hydro-carbon lamps—2742—W. Snell.
Hydro-carbon, production of—2972—F. Wilkins.
Lamp black—83—R. A. Brooman.
Land rollers—20—G. Sheppard.
Locks, and key for same—3382—W. E. Newton.
Macerated fibres, extracting liquor from—69—W. Anderson.
Machinery, mechanical oil for lubricating—3349—J. H. Lester.
Machines called roundabouts—3271—G. S. Harrison and S. E. Featherstone.
Motive power, applying water, &c., as a—3328—E. Dwyer & H. Moss.
Motive power, obtaining—3358—R. A. Brooman.
Motive power, producing—27—T. T. Macneill.
Oxygen, producing—85—R. A. Brooman.
Peat or bog earth, raising and treating—57—J. Hodges.
Photographic paper pictures to glass, applying—3092—A. J. Wright.
Pigments, preparation of—26—A. V. Newton.
Pipes, &c.—3314—E. Deane.
Pumps—2946—W. Easton.
Railways, fastenings for the permanent way of—12—P. S. Bruff.
Railway trains, stopping or retarding—3386—D. W. Thomas.
Sewing machines—61—W. S. Guinness.
Sewing machines for using wax thread—3170—W. Jackson.
Shears or scissors—81—W. E. Newton.
Sheet metal, forming articles of—3319—G. T. Bousfield.
Ships and vessels—87—C. O. Papengouth.
Silk, &c., tearing—3356—S. and C. Collins.
Skins, cutting, &c.—75—J. Clunan and N. Nightingale.
Steam boilers, feeding—45—A. V. Newton.
Steam engines—3380—R. Beck.
Steam wheel—3037—W. E. Gedge.
Tanned leather—3334—G. and D. Hurn.
Telegraphic and signal pillars or posts—89—W. Baines.
Vegetable fibres, treatment of—14—W. Staufen.
Ventilation, compression of air for—3153—P. de Monlock, P. Lehaitre, and A. Jullienne.
Vessels, propelling—3232—J. S. Watson.
Washing, scouring, and starching, machines for—63—T. Bradford.
Water, collecting and diffusing—2419—C. W. Orford.
Weaving, looms for—59—H. Moore and T. Richmond.
Weaving, looms for—3366—T. Watson.

Inventions with Complete Specifications Filed.

Kerosene, &c., a lamp for burning—116—C. N. Tyler.
Sewing machines—132—A. F. Johnson.
Steam, condensing—115—N. W. Wheeler.
Toy arms and projectiles—144—M. Klotz.

Patents Sealed.

1911. W. Diaper.	1939. E. Spicer.
1921. R. A. Brooman.	1955. I. Gregory.
1922. J. Leetch.	1964. E. Sabel.
1926. T. J. Mayall.	1976. E. Sabel.
1929. J. Juckes and J. Swinburne.	1977. J. Lawson and E. G. Fitton.
1931. J. H. Johnson.	2012. E. Sabel.
1934. M. Kenney.	2018. E. Sabel.
1936. W. and J. Richards.	2991. F. Pope.

From Commissioners of Patents Journal, January 23rd.

Patents Sealed.

1925. L. Petre and E. S. Tucker.	2017. L. Anderson.
1927. M. J. Roberts.	2042. A. F. Osler.
1946. T. Pepper.	2097. F. Brampton.
1950. T. Brown.	2105. J. F. Boettius.
1962. F. A. Abel.	2992. W., E., and J. Gray.
1967. V. Baker.	3047. C. H. Newman.
1969. J. Swinburne & J. Laming.	3071. W. Thompson.
1998. J. Crean and C. J. Barr.	

Patents on which the Stamp Duty of £50 has been Paid.

152. I. Ashe.	216. W. Mellor and W. Whaley.
153. J. Combe.	213. C. Turner.
155. G. T. Bousfield.	241. D. E. Hughes.
292. N. Wood and J. Stockley.	267. J. Pouncy.
156. W. E. Newton.	263. T. A. Weston.
230. M. A. F. Mennons.	

Patents on which the Stamp Duty of £100 has been Paid.

155. R. Bradley and W. Craven.	198. B. Lauth.
166. W. Poupard.	206. T. W. Rammell.
163. J. Whitehead.	265. J. Lane.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 2, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

February 7.—Renewed Discussion on the Paper read by Mr. W. Hawes (Nov. 29, 1865), "On the Proposal that the Railways should be Purchased by the Government." On this evening John Hawkshaw, Esq., F.R.S., will preside.

February 14.—"On the Gas Supply of Paris." By George R. Burnell, Esq., C.E., F.G.S.

Cantor Lectures.

The next lecture of the course, on "Submarine Telegraphy," by Fleeming Jenkin, Esq., F.R.S., will be delivered as follows:—

Lecture II.—Monday, February 5.

Shallow and Deep Sea Cables.

1. *Serving and Worming.*—Hemp or jute; tarred or tanned; several conductors in one cable.
2. *Iron sheathing*, common helical (spiral) form.—(*a.*) Extension. (*b.*) Kinking. (*c.*) Untwisting. (*d.*) Protection against rough usage. (*e.*) Strength.
3. *Iron and steel wire.*—Qualities used, welding, splicing.
4. *Sheathing machines* do not twist the wire.
5. *Permanency of wire.*—Rust, friction, galvanizing, Bright and Clark's bituminous covering.
6. *Statistics.*—Lengths; weights and duration of cables. Interruptions, total losses.
7. *Maintenance.*—Cost of repairs; returns on capital expended.
8. *Deep-sea cables.*—Depths on various lines. Modifications of common form. 1st Atlantic cable, 2nd Atlantic cable.
9. *Proposed forms* of deep-sea cables. Hempen rope, or Rowett's cable, Allan's cable, Duncan's plaited ratan cable, Rodger's, or Wells and Hall's plaited hemp cable, bare gutta percha.
10. *Statistics* of deep-sea cables.

The lectures commence each evening at Eight o'clock.

Artistic Copyright.

The following Memorial has been addressed to the Council:—

Gentlemen,—We, the undersigned, artists, engravers, and publishers of works connected with the fine arts, are desirous of bringing under your notice the present very defective state of the "Engraving and Artistic Copyright Acts," and do respectfully request you to give the subject your serious consideration, with a view to the speedy amendment of the said acts, and to use your earnest endeavours to prepare such a bill as shall fully meet the present emergency, and give to proprietors of copyright in works of fine art that effectual protection which it was doubtless the intention of the legislature to have secured to them by means of the aforesaid acts.

We would at the same time suggest that the various international copyright treaties appear to demand that the new act should be, as far as practicable, assimilated to the French law, which is found to work exceedingly well, and to be in France a most effectual bar to piracy.

We would further submit for your consideration that the invention of photography having placed within the reach of all a process whereby every variety of design may be cheaply and indefinitely reproduced, the piracy of copyright engravings has for the last few years been carried on in the most unscrupulous and open manner, particularly by persons who employ hawkers to carry their illicit productions from house to house, being thus able to sell them at a very cheap rate, to the great and manifest injury of the proprietors of the copyright in such engravings.

In those cases in which the persons so offending have a fixed abode, we would endeavour to obtain a more speedy and summary remedy than is provided by the existing laws, and in case of hawkers who move from place to place and act merely as agents, refusing to give the names of their principals, we would also pray that such means might be devised as would bring these also under the power of the law.

(Signed)

Sir E. Landseer, R.A.
W. P. Frith, R.A.
Thos. Faed, R.A.
John Everett Millais, R.A.
Richd. Ansdell, A.R.A.
Henry O'Neil, A.R.A
Fred. Sandys.
Alfred H. Corbould.
Thos. Brooks.
John Phillip, R.A.
Alfred Rankley.
G. Bernard O'Neill.
Robt. Collinson.
John I. Callcott.
John Lucas.
J. R. Herbert, R.A.
John Faed, R.S.A.
Thos. Jones Barker.
Fred. Goodall, R.A.
Charles Baxter.
Joseph Nash.
George Smith.
Geo. Chas. Maund.
F. Grant, R.A.
Samuel Cousins, R.A.
Thos. Oldham Barlow.
F. Joubert.
Thos. Landseer.
Fred. Bromley.
T. L. Atkinson.
Francis Holl.
Geo. H. Every.
C. Mottram.
William Holl.
Robt. Mitchell.
John Saddler.
Alfred Smith.
W. T. Hulland.
R. B. Parkes.
J. Richardson Jackson.
Lumb Stocks, A.E.R.A.
C. C. Hollyer.
Richd. J. Lane, A.E.R.A.
W. J. Edwards.
J. J. Chant.
W. H. Mote.
Robert Graves, A.E.R.A.
H. C. Balding.
Henry Graves and Co.
P. & D. Colnaghi and Co.
Goupil and Co.
Moore, McQueen and Co.
Henry G. Bohn.
Henry Wallis.
Ernest Gambart.
Chas. Marshall.
Henry Le Jeune, A.R.A.
Arthur Murch.
Henry Wallis.
Angelo C. Hayter.
Edward A. Goodall.
Stephen Pearce.
Henry Barraud.
Chas. J. Lewis.
H. Gastineau.
Sir Geo. Hayter.
W. R. Beverly.
Geo. Cruikshank.
John M. Walton.
W. M. Tweedie.
J. Wolf.
Louis W. Desanges.
O. G. Rejlander.
W. O. Geller.
Margaret Gillies.
Wm. Greatbach.
Arthur Sanders.
Geo. Sanders.
W. H. Simmons.
John P. Knight, R.A.
Daniel Maclise, R.A.
C. W. Cope, R.A.
Erskine Nicol.
Thomas Creswick, R.A.
John Mitchell.
D. T. White.
R. C. Lepage and Co.
R. & A. Ackermann.
Hayward & Leggatt.
Vincent Brooks.
Robt. Turner.
M. & N. Hanhart.
S. B. Fuller.
Joseph S. Wyon.
J. S. Welch.
A. B. Fores.
Thos. McLean.
Walter Clapperton.
L. V. Flatou.
Art Union of London (Thos. S. Watson, B.A., sec.)
W. C. T. Dobson, A.R.A.
J. Edgell Collins.
G. E. Hering.
W. F. Yeames.
E. Armitage.
Philip H. Calderon.
Jas. Sant, A.R.A.

Marcus Stone.
John Ballantyne, R.S.A.
Baron Marochetti, A.R.A.
Henry Mogford.
M. Ellen Edwards.
T. M. Richardson.
William Moore.
John Richardson.
T. George Cooper.
J. G. Middleton.
Philip Westcott.
Thos. Grieve.
C. Tomkins.
Jas. Stephenson.
Jas. Scott.
Samuel Bellin.
Philip Thomas.
Thos. L. Rowbotham.
T. H. Maguire.
Richard Buckner.
Samuel J. Carter.
P. R. Morris.
Edward H. Corbould.
Henry Warren.
Edmund G. Warren.
Joseph Bouvier.
Hon. Henry Graves.
Edward Hopley.
W. L. Leitch.
Frederic Tayler.
T. A. Prior.
G. S. Shury.
W. Giller.

The Council have resolved to comply with the request contained in the Memorial, and have invited those gentlemen whose names are attached to it to a meeting this day (Friday, 2nd February), to confer with the Council upon the subject.

National Portrait Exhibition, 1866.

The Council desire to draw the particular attention of members to this Exhibition, which is to open early in April next.

The Committee of Council have decided to limit it, for this year, to portraits of eminent persons who lived previously to 1688; and any members of the Society, either themselves possessing such portraits, or knowing of their existence, are requested to address the Secretary of the Science and Art Department, South Kensington, without delay. Portraits of foreigners who have obtained distinction in English History, as well as of eminent Englishmen, will be admitted.

Paris Universal Exhibition of 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for without delay.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

Proceedings of the Society.

Cantor Lectures.

"On Submarine Telegraphy." By Fleeming Jenkin, Esq., C.E., F.R.S.

Lecture I. Monday, January 29.

The Insulated Conductor and its Properties.

The lecturer stated that in the lectures he was about to deliver he should aim rather at spreading more widely the knowledge possessed by those practically acquainted with submarine telegraphy, than at announcing the latest discoveries or most novel theories.

1. *Terms Used:—Conductor, Insulator, Battery, Earth, Circuit, Current.*—Some elementary explanations were given with the view of explaining these terms. The action of a current on a magnetic needle, the simplest form of galvanometer and electromagnet, were shown with their application to practical telegraphy. The two sources of failure, viz., want of continuity in the conductor, and want of insulation forming a short circuit were explained. The reflecting galvanometer was exhibited as a means of indicating a feeble current.

The following is a more detailed abstract of the rest of the lecture:—

2. *Component Parts of Submarine Cable.*—These are, 1st, the conducting wire, generally formed of copper; 2nd, the insulator, surrounding the conductor, generally gutta-percha or india-rubber; 3rd, the outer covering, intended to give strength, and generally formed of a hempen serving, surrounded by iron wires, laid as in a rope round and round the core.

3. *Conductor.*—(*a.*) *Mechanical Properties.*—The conductor is almost universally made of copper, but a solid copper wire is apt to be brittle, breaking after being bent a few times; interruptions occurred from this cause in early cables: this defect is wholly removed by the use of a strand of several wires, generally three or seven. The tensile strength of copper wire is in some books given as 60,000 lbs. per square inch. That used for submarine cables, being selected for electrical rather than mechanical qualities, will only bear from 35,000 lbs to 39,000 lbs. per square inch. Copper stretches so much (10, 11, 12, or 15 per cent.) before breaking that its full strength can seldom be made use of. This extensibility is, as will be seen, a very valuable property, preventing the interruption of the circuit until the strengthening part of the cable be fairly broken. The following are convenient approximate formulæ:—A copper strand will bear $1\frac{1}{2}$ lbs. per pound weight per knot before breaking; it will stretch one per cent. with 1 lb., and will not stretch at all with 0·75 lb. per pound per knot; thus a strand weighing three hundred pounds per knot will barely support 450 lbs., will stretch one per cent. with 300 lbs., and will not stretch at all with 225 lbs. The weight of copper in lbs. per knot can be calculated from the diameter d in inches by the use of the following constants:—weight = 18,500 d^2 for solid wire, or 15,100 d^2 for strand. The joint of the conductor is made with great care: a scarf joint is made by soldering together two filed and fitted ends; this joint is wrapped round with fine copper wire to give it strength, and solder is again run round this wire; a second wrapping of fine copper i[s] then applied, and left without solder. The joint i[s] necessarily less extensible than the rest of the strand if forcibly torn asunder, the last wrapping of coppe[r] maintains the electrical connexion, being simply pulle[d] out like a spiral spring. No interruption from breakag[e] at joints has ever occurred since this system was adopte[d].
(*b.*) *General Electrical Properties.*—Copper is what [is] called a good conductor, offering small resistance to th[e] passage of the electric current; that is to say, a muc[h] less powerful current would be sent by any given batter[y] through a long iron or lead wire than through a copp[er] wire of equal length and diameter. Table I. gives t[he] relative electrical resistance of several substances com[-] piled from Dr. Matthiessen's experiments. The low[er] the number the better the conductor.

TABLE I.

Relative resistance of materials at 0° C. Wires [of] equal length and diameter.

Part I.—Conductors.

Silver, Hard	1·00
Copper "	1·00
Gold "	1·2[illegible]
Iron	5·9[illegible]
Tin	8·0[illegible]
Lead	12·0[illegible]
Brass	4·5[illegible]
Gold Silver alloy	6·6[illegible]
German Silver	12·8[illegible]
Platinum Silver alloy	14·9[illegible]
Mercury	58·1[illegible]

PART II.—INSULATORS.

Gutta Percha at 75° Fahrenheit
60,000,000,000,000,000,000...........or 6×10^{19}
Glass not less than
600,000,000,000,000,000,000,000,000...or 6×10^{26}

Conduction takes place through the mass, and not along the surface of the wire. A strand and solid wire of equal weights are equally good conductors; but owing to what is termed lateral induction, to be hereafter explained, the strand is at a slight disadvantage for rapid speaking through long submarine cables. Messrs. Bright and Clark, to avoid this defect, used in the Persian Gulf cable a segmental strand, built up of six wires fitting one another and drawn through a tube; they hoped thus to combine the advantages of the strand with those of the solid wire. Mr. Thomas Allan surrounds his copper conductor with fine steel wires, to give strength and avoid the use of heavy external protection. In a sample given to the lecturer, the resistance of the conductor so formed was about 30 per cent. more than that of a simple copper conductor of equal weight. Taking induction into account, Mr. Allan's cable would be about 50 per cent. inferior in speaking power to a cable with simple copper conductor of equal weight, and covered with an equal amount of insulating material. This inferiority is not a fatal defect if the cost of the outer protection is avoided. The general merits or defects of this plan will be spoken of in a future lecture; although the danger of decay where iron and copper meet is known, Mr. Allan's proposal deserves serious consideration.

(c.) *Chemical Properties of Copper Wire.*—A current flowing from the copper end or pole of the battery through a hole in the insulator to the sea, causes the formation of chloride of copper, a soluble salt. The copper is thus gradually eaten away, until metallic continuity is interrupted, and the cable ceases to transmit messages. The current from the zinc pole does not produce this effect, but only a deposit of soda in the fault, which, however, then allows a greater leakage, tending to enlarge the hole in the gutta percha. Mr. C. F. Varley has proposed to twist up a fine platinum wire with the copper strand of long cables. This wire would maintain the communication at any point where the copper might be eaten away.

4. *Insulator.*—(a.) *Gutta Percha and Chatterton's Compound.*—Gutta percha is pressed out, while warm and plastic, through a die round the conductor; several successive coatings or tubes are thus applied, till the desired thickness is obtained. The first coating is attached to the strand by a substance known as Chatterton's compound, which is also used between each layer of gutta percha, and between the separate wires of the strand, to prevent the percolation of water along the interstices, in case any part of the copper should be accidentally immersed in water.

(b.) *Mechanical Properties.*—Gutta percha has considerable tensile strength, bearing about 3,500 lbs. per square inch of section, but, owing to its great extensibility, it does not add more than about one-third of its whole strength to the copper strand. Roughly, it may be said to add in small wires 20 per cent. and in larger cases 30, 40, or even 50 per cent. to the strength of the copper strand; it will stretch 50 or 60 per cent. or more without breaking, but almost always fails as soon as the copper inside gives way. It will bear ill-usage, such as knotting, squeezing, or stretching, without injury, but can be pierced with a sharp instrument or cut by a knife without much difficulty. Uniform pressure, such as it sustains under water, improves its electrical qualities, augmenting its insulation resistance, according to Mr. Siemens' experiments, about 60 per cent., at 24° C, for every ton pressure per square inch, corresponding nearly to 1,000 fathoms depth of water. It becomes soft at about 100° Fahrenheit, and should, after manufacture, never be heated beyond 90°. The joints required are made by heating the two ends of the covered conductors after the copper is joined, and applying by hand successive coatings of warmed and plastic gutta percha. The separate layers of gutta percha are also cemented by Chatterton's compound; thus the joint is, when sound, very similar to the rest of the core. Extreme cleanliness and much skill are required in making these joints. Some years since the joints frequently failed, not always when just made, but after some months, becoming hard and brittle, and shrinking, so as to leave a gap between the old and new materials. The process is now thoroughly understood, and is a safe one in skilled hands, but in skilled hands only.

(c.) *India-rubber.*—This material is applied in many ways; most commonly tapes of masticated or bottle rubber are wrapped round and round the conductor until the required thickness is reached. At first these tapes were, as it might be termed, gummed together with solvents, but these caused decay, and have been abandoned; heat is now the common agent for effecting the adhesion. Mr. Siemens, who applied his tapes longitudinally, like two long half-tubes, used simple pressure to join the two halves together. He employed most ingenious machinery to cut the tapes the instant before they were applied to the copper, as the material only reunites if quite freshly cut; several successive coatings could be applied in this way at one operation. Some manufacturers considered that none of these methods were fully successful, and vulcanized the india-rubber, converting it into various materials of different degrees of flexibility according to the process employed. This material was also criticised, and Mr. Hooper has covered conductors with pure india-rubber next the copper, followed by a coating of oxide of zinc and rubber, and enclosed by a vulcanised jacket. In the process of baking the core to vulcanise the jacket, a little sulphur penetrates the india-rubber and the whole mass becomes remarkably compact and durable. Mr. Hooper heats the core to 250° Fahrenheit, and bakes it for four hours. The mechanical properties of these different materials vary greatly; they are all, however, very extensible, and do not add sensibly to the tensile strength of the conductor; they will bear considerable ill-usage, but are mostly softer than gutta-percha, and the pure rubber will not bear continued pressure even by a blunt surface, but gradually yields. The joints in each form are now made so as to imitate as far as possible the main core. Mr. Hooper bakes his joints two hours in a steam jacket.

(d.) *Chemical Properties and Permanency.*—When dry and exposed to light, gutta percha becomes dry and brittle, losing all its valuable qualities, and is said to be oxidized. Under the same circumstances the various forms of india-rubber decay in various ways; some become treacly, some brittle, some almost friable. Mr. Hooper's hard-covered seems to last best of all in air. When in water gutta percha is, so far as fifteen years' experience can show, absolutely permanent. Many thousands of miles have been laid down, and many hundreds of miles picked up after lying in the sea in various parts of the world, in deep and shallow waters, for many years, and not one single yard of material has been found which had under those circumstances decayed or lost its insulating properties. The importance of this fact cannot be over-estimated. The experience as to india-rubber is the very opposite to this; little has been employed, and a great deal of that little has been found to decay, so as to be utterly useless. No doubt improvements are continually introduced, and possibly some of the forms now made may answer better, but till the subject is more thoroughly understood it would be lost time to reproduce all the theories by which the various failures are explained. Out of five specimens supplied lately to the Indian Government, one only, Mr. Hooper's, proved durable even for a year. The lecturer's own experience confirmed this experiment. It must in justice be said, that considerable lengths of india rubber-covered wire are successfully used on land, supplied by Messrs. Silver and their descendant

the India-rubber and Gutta-percha Telegraph Construction Company, and by Messrs. Wells and Hall. The Indian Government has ordered about 100 miles of wire covered by Mr. Hooper's material, which will, therefore, now be subjected to a thorough practical test. India-rubber stands heat much better than gutta-percha.

(*e.*) *General Electrical Properties.*—Gutta percha is a very good insulator; all insulators conduct a little, but the figure written after gutta percha in table I. will show the relative resistance to conduction with equal bulks of copper and gutta percha. A better idea of the vastness of the number will be obtained by observing that light would take a century to travel through the number of feet which that number would express. The practical result of this degree of insulation with the Atlantic core is that more than 99½ per cent. of the current leaving England would reach America if the cable were but laid; any improvement in insulation will, therefore, only go to diminish this half per cent. loss, in itself of no consequence whatever. India-rubber has a higher resistance still; the chief advantage to be obtained from this high resistance is the facility it gives for detecting faults. India-rubber is, however, superior to gutta-percha in another electrical property, called its inductive capacity. More words per minute, in the proportion of 4 to 3 at least, could be sent through an Atlantic or other long cable insulated with India-rubber than if insulated with gutta-percha, the weight of insulator and conductor remaining the same. This point will be more definitely treated of hereafter.

(*f.*) *Absorption of Water.*—Mr. Fairbairn long since stated the superiority of gutta-percha to india-rubber for deep sea cables, owing to the comparatively small quantity of water which it absorbs. Probably the newer forms of india-rubber may have improved in this respect, but Mr. Siemens found that pure india-rubber absorbed 25 per cent., vulcanised rubber 10 per cent., and gutta-percha 1⅔ per cent. of their weight in pure water; these quantities were reduced to 3, 2·9, and 1 per cent. respectively in salt water. The absorption continued for three hundred days: it was eight times greater for india-rubber at 120 deg. of Fahrenheit than at 39 deg., but for gutta-percha it was only doubled by the rise in temperature. Mr. Siemens considered that pressure affected the absorption very little. The amount absorbed by gutta percha in no way damages it. This is proved by thousands of miles of submerged cables; for instance—the tests of the Malta Alexandria cable, laid four years since, under Mr. Forde's superintendence, by Messrs. Glass and Elliot. Part of this cable supports about half-a-ton per square inch pressure.

5. *Mechanical Properties of Completed Core.*—Few persons are aware of the great strength of the common gutta-percha covered wire. An experiment was shown by the lecturer, in which 5 cwt. was hung from the slender looking core of the New Atlantic cable; it stretched some ten per cent. under this weight, and was then taken down, knotted, squeezed, and cut open, when the copper conductor appeared quite undisturbed in the centre of the gutta-percha, which exhibited no trace of injury. Before the application of Chatterton's compound, the wire was liable to start out of the cable after it had been stretched and cut, or softened, owing to the unequal elasticity of copper and gutta-percha, but with Chatterton's compound considerable force must be used to drag out the copper wire, even when the core has been stretched and is cut open. Table II. shows the strains which various wires can support.

TABLE II.

	No stretch.	One per cent. stretch.	Breaking strain.
	lbs.	lbs.	lbs.
Atlantic core	340	414	660
No. 14 copper covered to No. 1, 107 lbs. copper, 166 lbs. gutta percha	134	162	218
No. 16 copper covered to No. 4, 73 lbs. copper, 93 lbs. gutta percha	100	120	150

Table III. gives the dimensions of the cores in some of the most important cables laid. It is noteworthy that 300 miles of the very smallest core practically in use, laid without any outer protection whatever, maintained our connection with the army for nine months during the Crimean war.

TABLE III.

Dimensions of Cores of important Cables.

Name of Cable.	Copper Conductor.		Gutta Percha.		$\frac{D}{d}$ Approximate Ratio	$\text{Log}_e \frac{D}{d}$
	Total weight in lbs. per knot.	Total diameter of conductor = d.	Weight in lbs. per knot.	Diameter in inches = D.		
Red Sea Cable	180	0·105	212	0·34	3·4	1·224
Malta Alexandria Standard	400	0·163	400	0·457	2·95	1·082
Persian Gulf	225	0.109	275	0·38	3·48	1·249
First Atlantic	107	0·083	260	0·38	4·8	1·57
Second Atlantic	300	0·144	400	0·464	3·28	1·19
England and Holland	143	0·095	223	0·34	3·47	1·244
Toulon and Algiers	107	0·083	223	0·34	4·26	1·45
Varna, Balaclava	73	0.062	166	0·3	4·84	1·58

Ninth Ordinary Meeting.

Wednesday, January 31st, 1866; William Hawes, Esq., F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Ashworth, George Leach, Roche Mount, Rochdale.
Barry, John Boyle, 16, St. Peter's-terrace, Notting-hill, W.
Blackburn, George, 32, Fore-street, City, E.C.
Brooks, William Elliot, 14, Gt. Queen-street, Lincoln's-inn-fields, W.C.
Butler, William, St. Helen's, Lancashire.
Ella, John, 18, Hanover-square, W.
Fase, Berkeley W., 22, Oxford-street, W.
Gushlow, George, 60, Newman-street, Oxford-street, W.
Homfray, H. R., The Place, Stradishall, near Newmarket.
Jonas, John, 150, Leadenhall-street, E.C.
King, John, The Rushetts, Thames Ditton, S.W.
Macintosh, John, Craven-street Chambers, Strand, W.C.
Myers, Abraham, 171, New Bond-street, W.
Nicol, Robert, Westminster Palace Hotel, S.W.
Phillips, Charles Palmore, 109, Fenchurch-street, E.C.
Pullar, Wm. Black, Perth.
Ross, J. C., Ravenglass, Cumberland.
Sim, William Fisher, Rose Bank, Peckham Rye, S.E.
Storr, John S., 26, King-street, Covent-garden, W.C.
Terry, Charles, Newport Pagnell.
Trevelyan, George, M.P., 8, Grosvenor-crescent, S.W.
Vansittart, Miss, Reading.
Walker, William, 1, Stock Orchard-villas, Holloway, N.
Wall, Prosper, 6, Fortess-terrace, Kentish-town, N.W.
Webster, George, Melbourne (care of Messrs. Hopcraft and Broadwater, 3, Billiter-square, E.C.)
Woodford, John Wm. Gordon, 12, Park-st., Grosvenor-square, W.

The following candidates were balloted for, and duly elected members of the Society:—

Barnes, James Richardson, Brookside, Chirk, near Ruabon.
Beggs, Thomas, 37, Southampton-street, Strand, W.C.
Binyon, George, 106, York-road, Lambeth, S.
Buckley, R. W., Currig Bawn, Ballintemple, Cork.
Coales, Robert, 10, Trinity-square, Southwark, S.E.
Elias, Alfred, 18, Princes-gardens, W.
Forrest, G., Springfield-house, Muswell-hill, N.
Goadby, Edwin, Loughborough, Leicestershire.
Graves, Boydell, 6, Pall-mall, S.W.
Gray, Thomas, Board of Trade, Whitehall, S.W.
Hamilton, George, 106, York-road, Lambeth, S.
Joule, Benjamin St. John Baptist, Thorncliffe, Old Trafford, near Manchester.
Mackreth, George Edward, 18, Little Tower-street, E.C.
Newmarch, William, F.R.S., Messrs. Glyn, Mills & Co., 67, Lombard-street, E.C.
Rule, Rev. W. H., D.D., 45, Bedford-street, Plymouth.
Smedley, Joseph Valentine, M.A., Oxford and Cambridge Club, S.W
Stewart, George, 47, Mark-lane, E.C.
Taylor, Samuel, 13, Manor-place, Walworth, S.
Wright, William, 32, Bucklersbury, E.C.

The Paper read was—

DWELLINGS FOR THE PEOPLE—HOW TO MULTIPLY AND HOW TO IMPROVE THEM.

By Thomas Beggs, Esq.

At the last meeting of the Social Science Association, held at Sheffield, I had the honour to read a paper on "The Home Accommodation of the People," and since then I have been requested, from several quarters, to resume the subject, and to elaborate some of the views only incidentally referred to. I embrace this opportunity of doing so, as many questions of vital interest to the working classes are now under public discussion, and the facts and arguments I have to produce may assist the elucidation of some of them. Be that as it may, the facts will form an appropriate introduction to the subject of this paper—"How can we multiply dwellings for the people, and how can we improve them in construction?"

I think it right at the outset to say that I shall confine myself this evening to a consideration of the question so far as it affects the industrious classes. I am aware that there is a large indigent class, who have become almost helpless in themselves, and who are suffering intensely from insufficient and wretched home accommodation, and that this class are costing the community year by year, in poor-rates and other means of public expenditure, a much larger sum than could, by possibility, if properly invested, be required to provide comfortable and healthy homes. At some future time I may enter upon the question of what can be done for this class, but at present I confine myself to the inquiry as to what can be done for the struggling classes, who equally demand our sympathy, and who are in reach of more immediate help. The lowest class will only be indirectly affected by my propositions, which aim at the improvement of the homes of those who, with limited incomes, have to pay from one-sixth to one-fifth of their earnings for very imperfect house accommodation. The class I allude to is composed of those who earn from 24s. per week, to the clerk, bookkeeper, shopman, or warehouseman, with salaries from £100 to £200 per annum. I know of no man more to be pitied than he who, with some 27s. or 30s. a week, has to support a wife and family, and has to seek in the central districts of London for apartments in which to shelter them. There are thousands of these engaged in a perpetual struggle, and on this evening I wish to keep this class in view.

For the last twenty years the subject has attracted the attention of practical philanthropists, and many excellent schemes have been devised and carried out with more or less success. Much substantial good has been done by them, but they have proved one thing which has an important value, namely, that private or public benevolence is totally unable to meet the large demand made for houses, where public improvements are going on with bewildering rapidity, and to such an extent that above 20,000 persons have in one year—the year 1865—been driven from their old habitations to seek new ones. We are forced then to the consideration of the subject by the weightiest reasons, and it will be necessary to employ all the resources that can be made available. The urgency is great, the efforts to meet it must be proportionate, and the pecuniary means to give them effect must be dealt out with no niggard hand.

Amongst the other means suggested, we are urged in some quarters to apply to Government for help, and to borrow money from the Public Loan Commissioners for the erection of lodging-houses and dwellings for the poor. I trust that, like a good subject, I am truly grateful to the Government of the country, and fully appreciate the principles recognised by them—principles which have raised the nation to a proud pre-eminence, and, notwithstanding many grievous defects, have made it an example and a blessing to the world. I am, however, jealous of government interference with the daily life, the trade, and the social arrangements of the people. It has become an axiom in political science that the more narrowly you can confine the province of government the better for the governed, and I believe that in the particular case before us the Legislature can render more effectual help by removing restrictions and obstructions out of the way than by any active measures it may be induced to take. It may be that money lent by the Government at a small rate of interest can be properly and beneficially employed in erecting homes for the indigent class—those who have not the power to help themselves; and, knowing as I do the necessities of the case, I will not say one word to discourage such an appropriation of the public funds. The application of such funds, however, requires great care, lest, in our zeal to avert suffering, we do mischief in other directions. It is easy to enervate certain classes by ill-advised and hasty benevolence, and our experience has shown that many of our schemes of philanthropy have tended to impair that spirit of independence among our people which, once destroyed, can never be restored. For the class at present before us, those who retain the power of self-help, I repudiate all such assistance. The Legislature may assist us by correcting some vicious clauses in Acts of Parliament and supplying some omissions, and if they will be pleased to do that they may safely leave the matter in the hands of the people themselves. After removing the restrictions, to which I shall hereafter have to refer, the best thing they can do is to stand out of the way.

I believe, after all that can be done by benevolent associations, or philanthropic individuals, or even by Government loans, that the remedy for defective and insufficient house accommodation will be found in giving free scope to commercial enterprise and the employment of capital in that direction. As I have said in another place, the man who will show that dwellings suitable to the requirements of all classes of the people, within the reach of their means, and of sound and convenient construction, can be made to pay a fair interest for the capital invested, is the true benefactor. It will be a still greater boon to bring the ownership of a house within the reach of that very numerous class who have now to pay high rents for very inconvenient accommodation. These two points define the positions I am about to take to-night, and as the latter is the more important of the two, that of making a man the proprietor of his own home, I will enter upon that first.

I propose to effect this object by an extension and further development of building societies and freehold land societies. Institutions of this class are not much known, and still less understood, by the middle and higher ranks; but they have found great favour among the industrial classes, as they afford facilities for the thrifty and sober man to attain a small property. They are becoming one of the most powerful agencies in the work of improve-

ment, and when some of the disabilities are removed, which arise mainly from the state of the law, they will serve a great and important end. They embrace all the advantages of the associative as distinguished from the communistic principle. Experience has shown that nothing makes a man so conservative as the possession of property. That state will be the most secure, all other things being equal, which contains the largest number of independent proprietors. The building society or freehold land society supplies the means by which the humblest workman who is sober and prudent may become possessed of a freehold house. If a man obtain this he will be careful of all changes likely to affect his own possessions; he will not be a ready dupe of the demagogue, nor will he be the promoter of strikes and combinations.

I propose, in the first place, to glance at the history of these societies; and as a freehold land society embodies all the principles adopted by a building society, I will take that as the basis of my exposition. Freehold land societies were commenced for a political purpose, that of creating forty shilling freeholds to secure votes in favour of certain projects of financial and parliamentary reform. The first society of this kind was established in Birmingham in 1847, the declared object being to purchase large estates, and to sell them out to the members in such portions as would make a garden plot or a site for a house, and at the same time create a freehold qualification. The success of the experiment at Birmingham encouraged others, and in 1849 the National Freehold Land Society was established, under the auspices of the late Mr. Cobden. These societies were established under the Benefit Building Societies' Act, 6 and 7 Will. IV., cap. 32, which provides (section 4) that all the provisions of the Friendly Societies' Act, 10 Geo. IV., cap. 56, and the 4 and 5 Will. IV., cap. 40, so far as the same may be applicable to benefit building societies, and to the framing, certifying, enrolling, and altering the rules thereof, shall apply to benefit building societies. It will be seen on reference to the Acts, that the Act of Geo. IV. includes the clauses which govern the rules of a building society, and the Act of 6 and 7 Will. IV. confers the ability to use them. I wish this to be borne in mind, as it is important to one of the suggestions I have to make in the sequel.

Before this a class of societies, known as building societies, had been enrolled under the 10 Geo. IV., but it could not be said that they conducted their business in a strictly legal manner. Their existence, however, was a manifestation of the desire on the part of certain classes to make the principle of association available for the purchase of houses. And it was for the purpose of giving these societies a legal status that the Act 6 and 7 Will. IV. passed the legislature. The building societies confined their operations to making advances out of a fund subscribed by the members to such of them as might wish to borrow; and might, by lot, rotation, or purchase, become possessed of a preference. The freehold land societies were organised for the express purpose of buying and selling land. In all other respects the rules, constitution, and management were essentially the same. The shares were usually £30, each member being permitted to take any number of shares. The entrance fee was one shilling upon each share, and the monthly payment four shillings. There were no fines upon unentitled shares, that is, upon shares upon which no advance had been made, and interest was paid upon all deposits. These were the general arrangements of the best regulated societies, but in many cases the societies were broken up, or amalgamated with better managed societies; but the cases of failure were not in such a great proportion to the cases of success as in the limited liability companies, which are supposed to have been managed by men of capital, and of commercial experience. The freehold land societies, worked by men who looked upon the power of creating votes as a very subordinate advantage to the social and moral benefits conferred by

creating saving habits among the people, have been
most successful. In fact, the political object has now b
entirely lost sight of. No political test of members
ever existed, and such would have been illegal. S
difficulties were thrown in the way by the revis
barristers. They gave the most eccentric and con
dictory decisions. This was not found to obstruct
progress of freehold land societies, the truth being,
except in periods of political excitement the majorit
men take little care about the vote. Many of those
possess it display little interest in it. This is kn
to every registration committee in every constituen
and is further shown by the experience of freehold l
societies, for it is found that those who are entitled, e
when the registration fee is paid for them, and an age
services offered, will not take the trouble by pers
attendance to place their names upon the register.
my judgment it is an immense advantage gained that
societies have lost their political character, and now c
duct their business on purely commercial principles.

In the working of freehold land societies there
one difficulty (arising from the state of the law) wh
had to be overcome. Although they were enrolled
permanent building societies under the Act, they ha
power to build, nor to purchase or sell houses or la
Every such society was, in fact, a savings bank
mutual loan society. The freehold land societies had
accomplish their object by an evasion of the law.
the time of their formation, no society or corporat
could become dealers in land, nor hold it for the purp
of making profit. The process therefore adopted by
societies was this. The estates were bought in the nar
of two gentlemen outside the society, having no visi
connection with it, and after subdivision they were c
veyed to the purchasers in the names of those gentlem
It is scarcely necessary to say that such a method of do
business was inconvenient, and attended with risks to
trustees of the societies, and the gentlemen who ac
for them, a responsibility being thrown upon th
not shared in by the members. It was quite opposed
sound commercial principle, but such was the law,
such is the method adopted up to this day by freeh
land societies to evade or get round it. The mem
could at any time, on giving twenty-eight days' not
draw out the money paid in, so that under a pa
arising from one of the disturbances to which our c
mercial system is always liable, the members who
not obtained advances might escape, while the trus
might be seriously embarrassed by having to forc
quantity of unsold land into the market under unfav
able circumstances.

No doubt this has operated prejudicially to the
terests of the societies, as practical men have, in m
instances, been deterred from joining them; but ne
theless the societies have prospered, and one—
National Freehold Land Society—had, in the first s
years of its existence, received, after deducting
sum of £204,532 which had been withdrawn, no less
£565,747. This includes a profit of £9,046. The soc
had purchased 113 estates in the home counties, c
prising 3,419 acres, and amounting in value to £750,
Land had been sold to the value of £456,789, and co
quently at that period there was land in stock to
value of £293,228. During this period there had
several depressions in the money market, and these
the effect of forcing upon the attention of the man
ment an alteration of the constitution of the society.
was first suggested that it would be well to convert
society into a Joint Stock Company, under the Lim
Liability Act of 18 and 19 Victoria, cap. 133. T
were several objections to this course, the princip
which was this, that it would destroy the original in
tion, and subvert the purposes for which such soci
were founded. At that time Mr. Lowe was at the B
of Trade, and representations were made to him by
Cobden, Mr. Wilkinson, then member for Lambeth,
Mr. Charles Gilpin, the chairman of the society,

the inconvenience encountered in this particular. Mr. Lowe paid great attention to this, and the result was the introduction of a Bill, which passed the legislature August 14th, 1855, the title of which is declared to be the Labourers' Dwellings Act. It is the 18th and 19th Victoria, cap. 132. That Act provides that, any number of persons not less than six may form themselves into a company for the purpose of erecting dwelling-houses, on signing articles in a form prescribed, which articles are to be registered with the registrar of joint-stock companies; upon being registered, such company to be deemed a body corporate with a common seal, but no registration to be made until the registrar is satisfied that three-fourths of the proposed capital has been subscribed, and that ten per cent. of the capital has been paid up; the registrar shall then grant a certificate, which is to be held as evidence of the incorporation. In the sixth clause it is provided that a company may not hold more than ten acres of land at one time without a licence from the Board of Trade, and there are other provisions, which place such company under the General Board of Health, for sanitary purposes. The Land Clauses Consolidation Act is to apply to it, and penalties are to be recovered under the 11th and 12th Vic. cap. 43; it is also provided that the Act does not extend to Scotland.

Under this Act a licence was obtained from the Board of Trade, and the British Land Company formed. The company bought all the unsold land held for the purposes of the National Freehold Land Society, and the two bodies became distinct. The National Freehold Land Society now confines itself to its legitimate business, that of receiving the deposits from its members, and lending the fund as it accumulates, to those members who wish to borrow, or to the British Land Company, making its profit out of the interest it obtains, and paying an interest of 5 per cent. to depositors. The British Land Company purchases estates in its own name, makes roads, executes works of drainage, and then sub-divides into suitable allotments for the district in which the property may be situated; they are then ready for sale. The estates are offered to the general public, and everything is reduced to commercial principles. Besides the Acts of Parliament I have mentioned, the company is brought under the the 7th and 8th Vic. cap 110, known as the Joint Stock Companies' Registration Act, and also under the 19th and 20th Vic., cap. 47, the title of which is the Joint Stock Companies' Act, 1856.

At the expense of being considered tedious I have entered into these details, as they possess an historical interest, and are most important in relation to the suggestions I have to submit.

Now let me show what has been effected by these societies. I have not been able to obtain returns from all the building and freehold land societies, and must content myself by giving a few examples. In Birmingham I find that from the first commencement of building societies, in 1842, up to the present time, not less than £2,500,000 have been invested in them, and mostly by the working and lower portion of the middle classes. In six freehold land societies in that town, all held in one office,

There has been advanced on mortgage	£561,500
Of which there has been repaid	302,500
Leaving still to be repaid	259,000

so that considerably more than one-half advanced to the members by way of loans has been repaid. It is stated that in Birmingham about 9,000 persons have, through the means of these societies, become proprietors of their own dwellings.

In the town of Leeds a building society has been in existence for about seventeen years. In June, 1865, it had 6,872 members, and the weekly receipts at that time were about £3,624. The amount advanced to borrowing members has been £749,864. Altogether there have been 24,589 members of the society, who have paid upwards of £1,200,598. There are several other societies in that town and neighbourhood.

To return to the metropolis. The Temperance Building Society has, according to its last report, received, in the ten years of its existence, £700,000, and lent upon property the sum of £509,000. The Conservative Land Society, according to the last report, has bought 66 estates, containing 620 acres, and making about 4,842 allotments. The total amount of subscriptions received by that society is £394,966.

The British Land Company, which originated from the National Freehold Land Society, has bought land to the value of £1,496,034, of which it has sold to the value of £1,246,234. The number of estates bought is 219, comprising 6,492 acres. As the average sub-divisions are about fifteen to an acre, I estimate that the British Land Company and the National Freehold Land Society together have created from 40,000 to 45,000 independent proprietors. Besides this the Society has been of great use as a savings bank. The interest, although variable, has generally been 5 per cent., and last year a bonus of one per cent. was added. A large number of small traders use the Society in the same way that merchants and manufacturers use the large banks, with the exception that they cannot use it for the purposes of honouring bills and cheques. The extent to which the Society has been made available in this way may be gathered from the fact that the total deposits from its commencement up to the present time have amounted to £3,074,907, and the withdrawals to £2,486,236; that is in fifteen years' existence. The capital of the Society in 1864 was £565,761 5s. 3d., of which £50,000 had been invested in securities, and the number of members at that time was about 12,000. The success of the British Land Company in its new business of buying and selling land has been most extraordinary. After an existence of about nine years it has been able to pay for the last two of those years a dividend of 15 per cent., and the shares are now selling at 75 per cent. premium.

I quote a few examples of societies, with the working of which I am familiar; but they are very numerous and are springing up in various directions. In 1860 the Messrs. Chambers computed the number of building societies at about 2,000, and the amount invested in them at about £10,000,000. Taking this as a tolerably correct estimate, the amount must have reached by this time £12,500,000. In Liverpool and Birkenhead I am informed that there are about 100 building societies, and in Manchester somewhere about 75. These general facts will suffice to show the importance of the subject in its social and political aspects, using the term political in its best and highest sense, especially when we ascertain that the great bulk of the members are men who live by wages. If these societies are working under a bad management or a defective code of rules, then it is quite clear that an immense amount of mischief may be done by them; if they can be properly directed, an equally large amount of good will inevitably arise.

I assert, however, that notwithstanding some failures, they have been attended by a great and unmistakable success, and this has been achieved in the face of great difficulties. The Act of Parliament under which these societies are enrolled, was not in the best way calculated to promote the object sought. It unfortunately happens that bills for such purposes are prepared to go before parliament by men who know very little experimentally of the industrious classes. The bills are brought up to meet emergencies, rather than based upon broad general principles, and are so fenced round by precautionary provisions, and provisions to meet the clauses of other Acts of Parliament, as to make them unintelligible to plain practical men, and they either dismay or become snares to earnest men who desire to adopt them. Many of the existing building societies are encumbered by rules extending over sixty

and eighty octavo pages. In the best conducted societies it has been a duty, involving constant labour and anxiety on the part of some of their leading men, to reduce the rules to a simple and working shape. The legislature did nothing, until the introduction of Mr. Lowe's Bill, a measure which, by the way, had to be amended by the 19th and 20th of Vict., to help on these societies. They have progressed in spite of the law, rather than by its aid, and some important but simple alterations are required to adapt the Acts of Parliament to the present circumstances of the societies.

Besides this difficulty there were others. Those among the middle and higher classes who felt a sympathy with the industrious did not look with favour upon building societies, nor in fact upon associated efforts of any kind. There were many causes for this. Certain communistic doctrines, about the period of their foundation, had been disseminated, and had taken hold of some of the more thoughtful of the working men, and Chartism was then playing some of its freaks and follies, so that all attempts at organisation among workmen were looked upon with great distrust. Besides this, the working of friendly societies and money clubs, especially the latter, had been so fruitful in disaster that it could only be expected that men of business knowledge and experience should shrink from a connection with societies in which working men constituted the large majority of the members. From this very cause the aid that might have averted mischief, in some cases of failure, and ensured success, was withheld. The apprehension was reasonable enough, and it was not seen that the turbulent and the noisy, who had become leaders in political societies and trade combinations, were, after all, not the representatives of the thrifty and sober working man. There is also this truth in connection with it, that the upper classes were then more in ignorance than they are now as to what the working classes can do for themselves. It was a common belief that the wealthy or that the Government must do what was necessary, and that little more could be expected of the people than that they should become willing recipients. Most of the proposals of that period savoured of that idea, and hence the failure of many well-meant schemes of improvement. This is a mere delusion. The true way of helping the people is, as I have already said, to remove obstructions out of the way, and leave them to rely upon their own energies for the remainder.

I should not refer at so much length to these false impressions, but from the knowledge that they still survive; that they restrain much voluntary exertion, and retard measures of sound legislative policy. As an illustration of these unsound views, I may quote the one put forward by the Messrs. Chambers, who, in speaking of the freehold land societies, thought it necessary to say a word of caution. "They recognised," to use their own words, "a certain good in giving to the working man the feeling that he is the proprietor of his own house, a portion of land, yielding (along with the franchise in England) a rent of forty shillings per annum, but at the same time they recognised a corresponding evil." When the evil came to be explained, it was this, that a portion of the working classes have precarious employments, and have consequently to remove from place to place, and, as heritable property is a fixture that a man cannot take with him, it might be a great trouble to dispose of that which he had made sacrifices to acquire. Therefore they recommend that the working classes should invest their savings to accumulate as moveable capital. What is all this but saying that freehold-land societies do not meet the circumstances of every working man? What society can possibly do that? There are thousands of working men, in all parts of the country, who are fixed in their place of employment, and who are little exposed to the accident of change, and to these men the facilities of obtaining a house of their own are most acceptable. Some other means of investing their savings must be adopted to meet the wants of those who, from necessity or inclination, are often changing their place of employment. We are liable to make the mistake of generalising from isolated facts, and of applying a principle to the whole number of cases, when really it is only applicable to a part of them. Each individual must be left to his own selection as to what is best, but there is no reason why the clerk or the shopman, who has from long service become a part of the establishment into which he went as an errand-boy, should not seek a permanent investment in a house because a bricklayer may have to move about to all parts of the metropolis in pursuit of his employment. It unfortunately happens that very few of the workmen who, by the nature of their employment or from other causes, are often changing their residences, ever save at all, or care about investing in anything but articles of present and personal gratification. I entirely dissent from the advice which follows—that it is better for the workmen, as a rule, to invest in institutions where their capital can be moveable at pleasure. Were this always the best, then a building society offers a means of investment equal to any other, giving a higher rate of interest than a savings bank, and, if he be careful in his selection, with equal security. He can remain as a depositor rather than a borrowing member, and thus have the power of withdrawing his capital and interest at any time. The working man is literally oppressed with loads of advice. No good measure can be devised for his benefit but it is prefaced by a chapter of sage counsel, and it is fenced round by so many precautions that he is bewildered, if he be not driven away from the proffered boon. To my thinking, it would be far wiser to treat him as a rational being, and not overwhelm him with so much kindness and patronage. Like others, he is governed by ordinary motives of self-interest, and must learn by his mistakes. The sober and the abstinent may be safely left to negotiate a few shares in a building society, the purchase or building of a house; and I will venture to affirm that the per-centage of mistakes will not be greater among the working classes than are proved to be made by the middle classes, who enter upon all sorts of projects, the honest description of which would appear as a caricature. There is one thing, however, certain, that it is better for a struggling man to place his savings so that they may not be easily available to meet every temporary demand and every pressing temptation.

Looking then at the institutions as they stand before us, two questions have to be answered—What are the advantages they have conferred? and are they susceptible of further development? The advantages are, I think, apparent. They give to the artisan what no other means present, an opportunity of acquiring a plot of freehold land and a freehold house. They enable him to pay the purchase money by weekly or monthly instalments, and by the contract of the society with the solicitor he is relieved from heavy law charges, and he obtains a clear title. He can enter the society at any time, and wait a favourable opportunity to purchase his land, and while his choice is in abeyance he receives a fair interest upon his deposits. Mr. James Taylor, in one of his speeches, said "That 2s. 6d. per week in a building society would in twelve years become £120, in a savings bank £92," a difference of £28. Then he says that "the £92 in a savings bank would take eleven years to make £120, while in a building society the same sum in the same number of years would reach £256." It will be seen by this calculation that there can be very few of the skilled workmen of the country who have not the means of becoming, through the agency of a building society, in the course of from twelve to fifteen years, proprietors of freehold houses, converting the rent they have to pay into the purchase money.

A second advantage accrues to a man from becoming owner of his own house, in the saving effected. A landlord has to cover in his rent the cost of collection, the insurance which good tenants have to pay for bad, and

the insurance also to cover risks of damage, and of the houses being unoccupied.

A third advantage will accrue to the proprietor himself, and also to the public. The principle of every man becoming proprietor of his own house will conduce to better construction, and to better sanitary arrangements. The society which purchases the estate in the first place attends to drainage, making roads, and providing sufficient width of streets, and imposes conditions as to general plans of building, so as to prevent obstructions of light and air, and the exercise of improper trades and employments. Such vigilance might be aided by alterations and amendments of the law as to the constitution of public administrative bodies. Our sanitary legislation is defective. No proper powers are given, and proper responsibility nowhere exists, especially in London. It has become a matter of necessity that our sanitary legislation should be entirely remodelled. The man who expects to be proprietor of a house will necessarily be more careful as to construction than if he merely expects to occupy it as a tenant. This point is of great moment to all classes of occupiers, for it requires no scientific knowledge to perceive that the vast majority of houses erected in the suburbs of London are of the lightest and frailest description, and that comfort, solidity, and convenience are sacrificed to mere external appearance. The practice prevails of building leasehold houses upon leasehold land. In some cases land is let for building purposes upon sixty years' leases, and houses are built thereon and let upon thirty years' leases. In most cases the ground leases extend to 99 years, and even in this case the interest of the builder is to do as little as possible, and therefore all but a universal system of "scamping" prevails. The builder must comply with the provisions of the Metropolitan Building Act, as interpreted by the district surveyor, but it is notorious that evasions and malpractices of a serious kind are permitted. Even in cases where the large owners of property are concerned, the surveyor employed by the estate very often only attends to substantial matters of construction, and the details, upon which so much depend, are left to the tenant, who has to pay a heavy tax during the first years of his occupancy for repairs upon bad work of carpenters, plumbers, and gasfitters. The true corrective for all this scamping will be to open facilities for every man becoming owner of his own house. This applies more especially to London, but in a lesser degree to many of our large towns. In the metropolis there is a lamentable defect in its municipal government. It is a conglomeration of large cities without the protection which other large cities in the empire possess, and is really suffering from the large amount of self-government which it enjoys.

Another advantage will accrue from the extension of building societies and freehold land societies. They will inevitably tend to attract men away from the various public-house clubs, in the shape of money clubs, clock clubs, furniture clubs, and a host of similar clubs, which have become the bane of working men in large towns, and impose fetters upon them which are rarely ever broken. A compilation of county court processes would tell a tale in relation to them infinitely more painful, because it is more extensive than the tally system, which has been the subject of so much public remark. Suitable investments for the humbler classes must have the effect of drawing them away from the public-house and its attractions.

I come now to inquire how we can strengthen these institutions, and promote their further progress and success.

I have shown that they are acting under several Acts of Parliament, and that freehold land societies are conducting their business by an evasion of the law. I am told by a very high authority that a great part of legal practice is now employed in evading the law in different matters. This may be a very pleasant exercise on the part of the profession, but it is not creditable to the legislation of the country, and cannot tend to increase our respect for the law itself, nor improve the moral tone of the people. At any rate our measures affecting the investments of the working classes ought to be clear, well defined and adapted to present exigencies. I ask, therefore, that the law should be revised and amended in relation to building societies and freehold land societies. It is absurd and mischievous to continue the present system, when the societies have outgrown the state of existence for which the law was made. What might be suited to them when they were small friendly societies, becomes a check and incumbrance when they have become large investment societies, with, as many of them have, an income of from £30,000 to £100,000 per annum. My judgment would be to incorporate them under the Companies' Act of 1862, giving them power to purchase land, build houses, or carry out any of the purposes for which they are embodied, on their giving the usual guarantees. I venture to suggest that it would be well to make it compulsory upon them to deposit at some public office, open to general inspection, a properly certified balance-sheet every year. I believe that this has been suggested as a proper precaution in the case of all limited liability companies.

The power does exist under the Act I have quoted—the 18 and 19 Vict.—to form companies on the limited liability principle; but it is most desirable to retain that part of the arrangements of a building society which enables the members to pay up the amount of their shares by subscriptions extending over a number of years. This might be done by sanctioning two or three classes of shareholders, and thus providing for those who can pay a few shillings a week more conveniently than paying the calls under the system of a joint stock company. If this were done, then I think that it would be better to render it obligatory for these societies to register under the Companies' Act, rather than under the Friendly Societies' Act; and this would greatly strengthen them, and increase their power of doing good.

It is desirable to grant to them a more simple mode of conveyance and transfer. At present, when a freehold land society purchases an estate the title is examined. Why should not the plan be deposited in the office established under Lord Westbury's Act, or any other properly-appointed office, after the subdivisions have been made, and why should not the lots be conveyed to the purchasers by a simple certificate, like that which a merchant obtains when he purchases bank or railway stock.

These alterations in the law would greatly facilitate the operation of freehold land societies and building societies, and give them increased power and freedom of action. I am prepared for the question—How does this apply to the condition of London, where the need is urgent, and the price of land so high as to place it beyond the reach of such societies for the purpose of finding dwellings for working men and men of small incomes. I will endeavour to supply the answer. There is a very large class who, by the aid of railways, could escape from London, and who would be glad to do so, and we shall have to look to this as one of our resources, for the erection of dwellings in the suburbs would lessen the competition in London itself, and consequently enforce improvement. Many thousands of clerks, warehousemen, book-keepers, and shopmen, who are not required to attend as early at their places of employment as the mechanic and artizan, would be removed, and make way for those who, by necessity or inclination, must be resident in the neighbourhood of their work. I am much amused by an objection which is raised to this suggestion very often, as if it ever was contemplated to make it a matter of police, and force the people out. It is only proposed to open a way for those who have the means and inclination to go a few miles from the busy centres of the London population, and the man would be left as much at liberty to select the locality in which

to find a home as he is left at liberty to go to what shop he chooses to buy his hat or order his coat.

There can be no doubt that, for the large majority of the working classes, we shall have to look to London itself for accommodation, and economise all the space within the police boundaries, and here again we shall have to invoke the aid of the legislature.

The difficulty that would meet a building society or a large commercial company, if even what I ask were conceded, would be that which now stands in the way of private enterprise, that of obtaining sites. Under present circumstances they cannot be obtained. We must, therefore, seek for compulsory powers to obtain land for building purposes. I ask for a power vested in the Board of Trade, the Privy Council, or any court established by the Act itself, by which any corporate body, on giving the usual guarantees, and depositing plans and proposals, and showing the want of dwellings for the people, may acquire land for their erection on the same terms that railway and dock companies now obtain it, without the necessity of going to Parliament in each case for a private bill. I ask also for a power to enfranchise leasehold property under certain conditions, and a power to compel the sale of such property as may be in the hands of incapacitated persons, or where circumstances prove the inability of the owner to comply with the laws laid down for the protection of the public health. I ask also that trustees of charitable and ecclesiastical institutions should be empowered to sell, exchange, or otherwise dispose of property tied up by trust, where such may be required for dwellings. And further that summary power should be given to the proper local authorities to remove from out of London prisons, workhouses, barracks, slaughter-houses, cow-houses, gas-works, and all noxious and dangerous manufactories, and to place the sites at the disposal of public companies, who would undertake to build dwellings upon approved models.

I ask also that freehold occupation may be further encouraged, by enacting in the same bill that, as in the case of Scotland, a man may become the proprietor of a flat or floor of a house. This should be done under the most stringent regulations as to sanitary arrangements. In a conversation with Mr. Waterlow, I am glad to find that he is in favour of this view, and he states that opportunities have occurred where he could have disposed of the fee simple of some suites of rooms much to the advantage of his own undertaking, and to the benefit of the purchaser. There will probably be some difficulty in such an arrangement, and it has been suggested to me that long leases might be granted, which would equally answer the wishes of the occupiers. I believe that a committee connected with the Society of Arts came, after much consideration, to the conclusion that the Scotch system was not desirable nor applicable to England; and they suggested that a plan by which the occupiers could become shareholders in the block of buildings in which they were tenants would be more acceptable and more convenient to our English tastes. Mr. Thomas Twining favours this view. I am quite content to leave it an open question, but I need scarcely say that my predilections are in favour of creating freeholds wherever it is practicable.

I submit these suggestions with all due deference, as I know that I am speaking in the presence of gentlemen who have given much thought and attention to the subject, but possibly I may possess the advantage that I have been for fifteen years engaged in working in the largest freehold land society in existence. I have no fear that the means will not be found among the people themselves, if the obstructions are removed, and fair facilities given. When I see that they cannot be found by the people themselves, I will make one to go to the Government and ask for a loan. At present I content myself with asking that the legislature will remove the difficulties out of the way.

I admit that my scheme of relief, through freehold land societies, will only meet a comparatively small number of cases, but then it will not interfere with any other which aims at providing dwellings for the people, and all the measures I have asked on their behalf are equally necessary to every other enterprise. I hold there is only one difficulty. There is no want of capital, there is no want of the inclination to employ it in building houses for the people—the want is simply this, the sites on which to build them obtainable in places required by the occupants, and at a price which will render the undertakings remunerative. This is the one great difficulty which I desire to fasten your attention upon, and to enlist your exertions to remove.

I must now return to the commercial bearings of the general question. There have been several suggestions made as to what ought to be done to meet the present want. One of them is to make it a condition, in granting new railway Bills, that companies should erect accommodation for a number of persons, equal to the number they displace. A difficulty occurs to me at once. On whom is the power of supervision to devolve, as to the sites, construction, rents, and other matters relating thereto? Are the railway companies to be made proprietors of cottage property as well as of railways? If so, as the control of such is not within the scope of their legitimate business, it may be fairly assumed that it will be neglected. That which people are compelled to do against their inclinations and their interests is never done well, and this rule is of universal application.

Another plan is, as I stated at the outset, to borrow the money from the public loan commissioners, at a low rate of interest, to build houses. I understand that the Lords of the Treasury are prepared to recommend that course to Parliament, on condition that the corporations or public companies do not claim a profit above 5 per cent. I have promised not to oppose such a scheme, as it is shown that the state of London demands extraordinary efforts; but I may venture to point out the probable consequences. First of all, the case is altogether different from that which had to be treated recently in Lancashire, arising from the cotton famine. There we had a large branch of industry suddenly paralysed; but although the distress was severe, under the worst of circumstances, it could only be temporary. It was altogether an exceptional and extraordinary case. There the Government interference and aid were most legitimate, but here we have a permanent want that requires provision of another kind, and we ought to be satisfied that commercial enterprise, upon which we depend for the supply of every other want, is not ready or able to meet the demand for shelter, before we ask the Government for loans of money. First of all, the mere act of building houses by borrowed money at less than its market value will have the effect of checking that commercial enterprise upon which, whatever we may do at present, we shall have in the long run to fall back for the accomplishment of this great end. Then, again, why restrict to five per cent. the profits of those who may employ their capital in the undertaking? This is really destroying the virtue of their own proffered aid, and it will confine the undertakings within the range of benevolent exertion. The undertakings under such circumstances, even with the advantage of money at a small rate of interest, will not pay, as undertakings conducted wholly or partially from benevolent motives never do, and thus the tendency of the whole thing is to keep out of the field of operation the very men who are best able to work for the public benefit, and who will work under the powerful incentive of self-interest—in fact, that of making a fair profit out of the capital they employ. I think it is therefore better for us to look, in the first instance, at the existing discouragements to the employment of capital, and try to ascertain whether we cannot effect such changes as will invite it into this field of useful and necessary labour. I have never yet known that a departure from sound economical principles led to satisfac-

tory results in the long run. I believe that if we could satisfy the public mind that suitable sites were to be obtained, a company might be formed with a powerful and influential direction, and a sum of money raised fully adequate to the requirements of the case, so that in five years we should hear little or nothing of overcrowding or of deficient house accommodation.

This may be considered the language of enthusiasm. I can only assure you that the views given to-night are the result of deliberate conviction. I know that what I propose does not offer immediate relief, and in certain quarters it is objected to on that account. Let us not deceive ourselves. When an evil has become so large and so inveterate as that we seek to remove, we cannot find an immediate remedy, and we may waste much labour by an impatience in conquering the slow processes by which great ends can alone be accomplished.

I confess my inability, after twenty-five years' study of the subject, to point out a short road to the desired goal. Society is now reaping the harvest of a sinful neglect, and we must take care that the remedy we employ does not rise up afterwards in judgment against us, among the many other examples of ill-judged and wasted benevolence. Above all, let us not nourish that feeling of hopeless dependence which pervades so large a portion of the poorer classes. It is well to give to the man famishing of hunger to-day a basin of soup and a loaf of bread, but let us not neglect to put him in the way of earning it for himself to-morrow. This should be borne in mind in all our schemes of practical philanthropy. As to the argument to which I have referred, it belongs to the objectors, rather than myself, to offer a scheme for immediate relief, and when it is ready I will promise it my support. I offer mine as one among many—a plan that will reach thousands of the struggling classes, who, from their neighbourhood to and close contact with fever, indigence, intemperance, and want, are in danger of falling into the same gulf. I believe it is a sound philosophy to try to save those who are in danger of falling, instead of expending all our energies upon those who have fallen. Besides, by extricating those who are willing to make efforts to secure a home, we are lessening the amount of competition, which is very fierce indeed, for such accommodation as our towns now afford. Indirectly, then, we reach the most helpless class, and what more does any scheme now before the public do? It is well known that, in the blocks of buildings erected by the Peabody fund, as well as those by Mr. Waterlow and the several societies which have been working for many years for the same purpose, none of the places are taken, or even sought, by the lowest class. They are sought, accepted, and welcomed by those whose sense of delicacy and desire for comfort still survive, and this is very much to effect. However, my scheme, which has been largely successful, does not in any way interfere with any other. I am well aware that we must rely upon many schemes working simultaneously; but I believe that those schemes will be the most productive of good which are made to depend upon the exertions of the people themselves. The experience of a busy life has taught me to lay down this as a maxim, to do nothing for the people that they are able to do for themselves.

DISCUSSION.

Mr. Walker (of Rugby) said, having had the honour of being a member of the Committee, appointed at the instance of the Council of this Society, on the subject of dwellings for the working classes, and having for many years taken a great interest in that subject, he would express his admiration and appreciation of the excellent paper to which they had listened, with nine-tenths of which he agreed; but there were some points, and these of considerable importance, with which he could not but disagree. One of the main points to be considered was, whether the labouring population should be encouraged to become owners of their own dwellings? His own opinion was that it would be injurious to the community for that class to become owners of the cottages and rooms which they inhabited. If all these poor persons were what they ought to be—if we could realize our *beau ideal* of a peasantry and of labourers—if these persons were, as a rule, careful and prudent, nothing could be better than that they should be the owners of their dwellings. But, unfortunately, the contrary was too much the case. He had seen that both in the country and in towns the dwellings that were owned by this class were generally in the worst condition, and were a nuisance to the neighbours. They, too often, treated their dwellings as they did themselves. They were clean neither in their persons nor their apparel, and as with themselves, so with their dwellings; therefore, taking the poorer classes as they were, it was undesirable that they should become owners of their own dwellings. Another reason against this was that such dwellings would probably, in a short time, pass into the hands of speculators. The owners would find they had the means of raising money on their little tenements, and these would soon pass out of their hands into those of speculators, who would take no pride in their property, but who were among the worst class of owners of dwellings in London and elsewhere. It had been argued that vast numbers of the labouring classes were stationary, and therefore might, without inconvenience to themselves, be the owners of their own dwellings, but they composed but a very small portion; the large proportion of them were, of necessity, migratory. Another important point was lightly touched upon in the latter part of the paper—that was, the proposal to give compulsory power to purchase sites for labourers' dwellings. He objected to that most strongly. Compulsory powers had been stretched to the utmost already in England. In the case of great public undertakings, such as railways or canals, which must go in a certain line, the convenience of individuals must give way to the public interest; but he submitted there were no such grounds for compulsory interference in the case of sites for houses. There was plenty of space within half-a-dozen miles of St. Paul's on which they could erect dwellings for more than five times the number of those who were in want of them. There were many places in London now occupied by miserable tenements which might be covered with fine blocks of buildings. His own idea of the mode in which dwellings for the labouring classes might be multiplied and brought within the reach of that class, was by improved methods of building. The land might be bought sufficiently cheap within a moderate distance of the centre of London. Plenty of such land might be bought at £1,000 per acre, and even at a good deal less, and by building four-storied houses and giving fifty square yards to each tenement they might for £35 supply the site which, at 5 per cent., was only 35s. a-year, not a heavy rent to a London artizan or labourer. He thought he had himself, to some extent, solved the difficulty of providing labourers' dwellings at a sufficiently low cost in the country, where it had been the cry that landowners could not build cottages to yield them a fair per-centage upon the outlay. He had built them for £70 or £72 each, very good cottages indeed. The particulars of them were published some time since in the *Journal*,* and he wished to repeat the statement he then made—that London possessed greater advantages for providing dwellings at a cheaper rate, in proportion to the income of the classes that would inhabit them, than the country. In London they had the advantage of water supply ready at hand, and domestic arrangements altogether could be carried out with far greater facility in an aggregation of dwellings in London than in the country, where all such matters must be specially provided for. He saw present a gentleman who had done much towards the solution of this question

* Vol. XIII., p. 319.

(Mr. Alderman Waterlow), but he must be allowed to take this exception to what that gentleman had done, viz., that his buildings were rather too good. If his buildings had been of a simpler character, no doubt they would have paid better, and perhaps they would have been better suited on the whole to the class who were to inhabit them. At the same time he said, all honour to Mr. Waterlow for what he had done in this direction.

Mr. Alderman Waterlow agreed with the last speaker that they were much indebted to Mr. Beggs for the very excellent paper he had read. He disagreed with Mr. Walker in thinking it undesirable that the working classes should be the owners of their dwellings. If that object could be accomplished it would do more to elevate that class than anything else. If they gave a working man a stake in the country, depend upon it he would be the foe of all anarchy and of those mischievous combinations which paralysed commerce. He thought Mr. Beggs had pointed out a better plan than any he had heard before, by which the object they so much desired might to some extent be carried out. There might be some difficulty in adapting the usages of freehold-land societies to the metropolis, because it was impossible they could build small houses, so that each occupier could have his tenement on his own plot of ground. They could only build in large blocks—*usque ad cœlum.* They could not utilise the ground sufficiently unless they built on that system. Then the difficulty was to separate one tenement from another so as to give a freehold right in each. If they could do that, instead of the picture of slatternly and dilapidated houses which had been drawn by Mr. Walker, he believed the scene would be changed as by the wand of a magician. A man naturally would not wilfully allow his own property to be destroyed; he would rather take all possible care of it; but if he lived in a highly rented house under a harsh and uncompromising landlord, he would have no interest in taking care of the property. As an illustration of this, he might state that in most of the tenements erected by the Improved Dwellings Company, of which Lord Stanley was chairman, they endeavoured to fix the rent at a sum lower than that of the surrounding tenements, and they did so upon this commercial principle—that if a man had got a tenement at a lower rate than he could get it elsewhere, he had such an interest in it as would induce him to take care of it, so that the landlord should not turn him out, and the 3d. or 6d. a-week he saved in rent the owners saved in wear and tear of the property, and both parties were mutually benefited. If the principles of freehold land societies were applied to separate tenements in blocks of buildings, there must be some alteration of the law to compel some constituted authority to maintain such parts of the building—such as the roof, the staircases and the foundations, which were common to all the tenements. No individual would be inclined to take that responsibility upon himself solely. He apprehended there would be no difficulty about that if some benevolent lawyer would give his mind to the subject. Perhaps it might be possible to entrust these repairs to some of the sanitary bodies who now took action in cases where tenements became a nuisance. If that were done, they would be in this position:—Suppose a freehold building society, with 500 members, paying one shilling a week each, that would be £25 a week, and thus every sixth week they could convey a tenement, because the tenements built by the Improved Dwellings Company averaged from £130 to £150 per tenement, some having two rooms with conveniences, and some three rooms with conveniences. The great difficulty, however, was the obtaining sites. The gentleman who first addressed them had objected to compulsory powers in this matter. He (Alderman Waterlow) did the same except under extraordinary circumstances; but when these did arise he thought the exercise of compulsory powers was called for. No man had a right to hold property which was a common nuisance to his neighbours, or to have control of dwellings which were known to be typhus nests and fever dens. If the owner kept his property in that state it ought to be condemned by some constituted authority, and if the owner would not utilize it, let it be sold at a fair value to those who would do so. In no other way did he think many of the foul fever-dens of the metropolis could be rooted out. Then as to the suggestion that land could be got within a reasonable distance of London, on which dwellings might be erected for the labouring classes, all he could say was, his own experience proved the contrary. Within five or six miles of London they must give from £1,000 to £1,500 per acre. Mr. Walker stated that they could buy land so as to bring the ground rent to the tenant down to £35 a year. His own experience went to show it to be nearer £50 or £60 a year. He had lately taken a lease of some ground at the back of Victoria-street, and putting the largest number of buildings upon it, he was compelled to bring the ground rent of each tenement to above 1s. per week, and there was an additional 1s. 6d. per week in the shape of local rates. The trustees of the Peabody Fund, who had recently published a report of their work during the last three years, very properly adverted to the burden of local taxation as one of the greatest hindrances to the better accommodation of the working classes in London. No doubt it was so, but the discussion of that subject would employ more time than could now be given to it. He hoped Mr. Beggs would elaborate his scheme of applying the principles of freehold land and building societies to separate tenements in large blocks, and by so doing he would confer a great boon upon the working classes of the metropolis and large towns.

Mr. C. Stuart Barker remarked that his experience led him to coincide with the broad principles which had been advanced in the paper. They must be all agreed that there was no subject of greater importance at the present moment than the providing of healthy and suitable homes for the working classes, lying, as it did, at the foundation of the social and moral improvement of the people. Largely as building operations were now being carried on in and around London, the houses which were erected were beyond the requirements as well as the means of the working classes, and thus, with a rapidly-increasing population, and an extensive devastation of existing dwellings to make way for public works and improvements, there was no adequate provision made to supply the demand for other dwellings. On the subject of building societies, Mr. Barker remarked that the members of such societies consisted of two classes—the investing members and the borrowing members. The money which was advanced to the latter class might be repaid in small instalments spread over a number of years, and he did not agree with Mr. Walker in his views as to the owners of houses under such circumstances allowing them to go into a state of dilapidation; self-interest alone would prompt a contrary course. He agreed with Mr. Beggs in the conclusion at which he had arrived, that the best way of providing dwellings for the working-classes was to help them in providing for themselves. Building societies were doing a great deal in that direction, and he was happy to see they were multiplying on every hand; but those societies were circumscribed in their operations by the law. What they wanted was power to purchase land and build houses, with facilities for borrowing money at a low rate of interest. At the present time those who borrowed money from these societies paid from seven to ten per cent. for it, which went into the pockets of the investing section of the members. For his own part he saw no reason why the facilities which were afforded some years ago by the legislature for borrowing money for improvements in landed property, should not be extended to the erection of buildings in towns. That had been done in the country without any of those evils accruing which Mr. Beggs seemed to dread would follow upon government loans for this pur-

pose. His own opinion was that government loans would greatly facilitate the operations of these societies, and were calculated to do a great amount of good.

Dr. Brewer remarked that the great principle which underlies every effort to improve the condition of the people was self-reliance—that enlightened self-respect and self-conservancy which had given rise to the old maxim, that "the man who is most self-reliant is the most God-dependent creature in the universe." Having on a recent occasion attended, with great pleasure, a *soirée* of the compositors employed in the printing-offices of Messrs. Cassell, Petter, and Galpin, and having witnessed their behaviour, and heard the sensible addresses which were made by members of that body; having afterwards visited the dwellings in Clerkenwell, where many of them were located, the impression was forced upon his mind that, with all the accumulations of wealth in this country, civilisation, in the highest sense of the term, appeared to be retrograding as regarded the home-accommodation of the working classes. There could be no doubt that a freehold title in bricks and mortar might be as readily accorded as in land, and whatever might be done in that direction upon the system advocated by Mr. Beggs, that gentleman might rest assured that it would not act to the disadvantage of any schemes which other persons might think more favourably of.

Mr. J. Bailey Denton begged to thank Mr. Beggs for the assistance which his paper had given to the more perfect understanding of this question. He agreed with the principle of each man becoming his own landlord, but went with Mr. Waterlow in the opinion that a man must not, necessarily, build his own house, but let him become the owner after it was erected. Let him do this gradually, and he believed he would become a better member of society, and would get just what he ought to have—viz., possession of a good house on the best terms. This would be facilitated by the use of money at a low rate of interest repayable by instalments in a certain number of years. If the privileges in that respect which were enjoyed in the case of land improvements and the building of cottages for the labouring population in the country were extended to the dwellings of the working classes in towns, he believed it would be a great boon. If 6 per cent. were paid for 30 years on the capital borrowed, the principal (with the interest) would be repaid. If the principal and interest were thus repaid in 30 years by such facilities as the legislature might give, he thought it would be an enormous boon to those who were desirous of building houses for the working classes. He wished emphatically to take exception to the observation that land could not be got in or near London at less than £1,000 per acre. He should be glad to receive an order to procure any number of acres at from £200 to £400 per acre; and if those who were philanthropists in this question would employ him, he would willingly do this gratuitously, because he loved the subject, and should be glad to assist in this good work. There was one view expressed in the paper which he specially wished to endorse; that was as to the giving compulsory powers to obtain building sites. He was also in favour of enabling powers, by means of which corporations, ecclesiastical bodies, and other incapacitated persons might be enabled to sell their land. He would go further, and say that those trades and manufactures which were so obnoxious in the metropolis ought to be expelled from it, and the spaces they occupied should be devoted to the building of dwellings for the people.

Mr. White thought that there was little chance of that careless and improvident portion of the working classes to which Mr. Walker had alluded ever becoming the owners of their dwellings to any large extent. Building societies might do much, but the evil to be contended with was too gigantic for such efforts to entirely eradicate. He regarded proper dwellings as the third want of our existence, bread, water, and shelter being our three principal necessaries, and the present state of the dwellings of the poor was a stigma upon our boasted civilization and wealth. He maintained that the working man ought to be able to procure a proper dwelling at the same rate as he could obtain bread. He could now supply himself with bread for twopence a day: why should he not be able to live in a room for the same amount, viz., 1s. per week, or, if he were married, 2s. per week for two rooms? The reason why bread was cheap was that it was untaxed, and in like manner untaxed dwellings would enable the owners to reduce the rents 33 per cent.; but that could not be done under the present pressure of taxation, which was especially heavy on the poorer class. The chief suggestion which occured to him was to untax the habitations of the poor, or if taxation was to be continued, let it be done on a system of greater equality than was the case at present.

Mr. Thos. Webster, Q.C., F.R.S., said it was a very agreeable proposition to hear of untaxed houses, and they might be eloquent upon it without being able to bring it to a practical result. After all the discussion upon this subject here and elsewhere, he thought the real solution of it lay in a nutshell, viz., what was hinted at by Mr. Bailey Denton—compulsory and enabling powers. He would go to the extent of saying that compulsory powers were essential, but under proper restrictions. They knew with what jealousy compulsory powers were regarded by the legislature, and justly so, except in extreme cases, of which he thought this was one. The great desideratum was suitable dwelling accommodation for the people near their work. It did not do to talk of taking them into the country; cheap land in the suburbs and weekly railway tickets at a shilling per week were all very well in some cases, but it was essential to many of the classes of labour that suitable dwellings should be provided them near the scenes of their labour. Adam Smith and other political economists had stated that man of all others was the most difficult material to move, and he must live near the spot which was the scene of his labour. He (Mr. Webster) would point out what would take place in the metropolis if compulsory powers of a large kind were granted. A great many landlords had properties which were so many plague spots, and scarcely worth the having. They would be only too glad to combine with others in the removal of the evil if they could do so; but it might happen that there was a small amount of intermediate property which could not be dealt with except by compulsory powers. Such compulsory powers should be placed in the hands of one of the public departments, and by these means large plots of ground, now covered with buildings that were a disgrace to our age, would be cleared. By the combined efforts of ground-landlords, under private agreement, with enabling powers to those who at present could not give a title, together with compulsory powers to such an extent as was necessary in extreme cases, such plots of land might be put into the hands of individuals who had both means and inclination to provide for the working classes that accommodation on which their hearts were so much set. There was no doubt about the grievance or kind of remedy that should be adopted, nor was there any doubt that capital would be employed in this direction.

Mr. Webber inquired whether Mr. Beggs was possessed of statistics from parliamentary returns, showing the percentage of building societies which had not succeeded, and the percentage of original holders who retained their property, because he could not help thinking that the great mass of the working classes, after they had provided food and clothing for those who were dependent upon them, had very little to invest in the way of possessing themselves of houses. In the *Clerkenwell News* he had seen a whole column of advertisements of appropriations in building societies for sale.

Mr. Hilton, having acted in the capacity of treasurer, trustee, and director of building societies, would say that nearly all the successful societies had been conducted by

gratuitous management with no paid officers. He believed it to be the fact that the working classes used the building societies as savings banks, and the per centage of houses bought by them was ridiculously small. The houses built by building societies were, as a rule, of the very worst construction; and to illustrate how easily a great number of these might fall into one person's hands, he might state that, within his own knowledge, 3,500 small tenements in London belonged to one man. As to the neglect of sanitary regulations, not long since the Vestry of which he was a member had occasion to issue twenty summonses against one person for offences of this kind. In such cases as these the observations of Mr. Webster applied very strongly. In all parts of London they would meet with property of that description which, in the absence of compulsory powers, would always form an effectual barrier to all attempted improvements. It was within his own knowledge that large areas of property belonging to the Ecclesiastical Commissioners at the east end of London were in a most disgraceful condition; and it would appear that there were several noblemen who had properties in the metropolis about which they were so careless and indifferent that they were sub-let in all sorts of ways, and became the most desperate fever-spots in the metropolis.

The CHAIRMAN, in inviting the meeting to thank Mr. Beggs for his very able paper, which had elicited a discussion of considerable interest, would state one or two grounds on which he differed from several of the speakers, the first being on the question of freehold land societies, as applied to London. That which was applicable to the country districts was not applicable to London. They could not afford the space for each man to build his own separate house; they could not afford to pay the ground-rents which fell upon that house. They must, therefore, look to some other system by which they could cover plots of land with a large number of rooms under one roof and in one building, which, under improved legislation, might be held by working men as separate and distinct tenements. Then came the question already adverted to by Mr. Alderman Waterlow—How were they to keep the whole of that building in repair as regarded the roof, staircases, and foundations? Under a carefully-drawn agreement a certain charge might be placed on each tenement to cover such dilapidations, and such rules might be enforced as that if a tenant allowed his portion to get out of repair he might be subject to a penalty. That would overcome the difficulty with regard to that class of houses. He agreed that it was only by enabling and compulsory powers that they could succeed in obtaining sites for these purposes. He had no doubt money and land were to be had in plenty if the way were fairly opened to their employment. To this end compulsory powers were in some cases absolutely necessary. They did not ask for powers to take property without assigning any other reason than that labourers' dwellings were required to be built upon it, but they did call for compulsory powers with regard to those localities which were reported to the boards of health as being of a pestilential character, and detrimental to the public health, which were not only pernicious to the immediate neighbourhood, but tended to increase the death-rates of the whole metropolis. It was known that at the present time plague-spots existed which were irremediable by any means short of an entire sweeping away of the buildings upon them. He would only ask for compulsory powers in such cases as those. Having got those powers, let capital be employed upon buildings which would give a fair return upon the money invested. There was reason to believe that capital employed in this manner would now be more remunerative than was the case a few years back. He appealed to Mr. Waterlow whether such investments did not realise from 6 to 8 per cent.; and if that return could be made upon the capital, how much more would be obtained if half the amount were advanced by the government at a low rate of interest? It had been argued by some persons that if they borrowed money from the government, there ought to be a limit to the rate of profit to the owner. From that view he entirely dissented. The object should be to afford such a return to those who supplied the first capital as would not merely induce them to erect a few buildings, but to provide habitations for hundreds and thousands. The thing could not be done in a small way. They must create some great organisation or corporation which would go into it boldly, and which by its character would have some influence with the government, and induce them to give their assistance. There was one point on which he thought some misapprehension existed. They had heard a good deal about the destruction of houses for the purposes of railways. He confessed he did not regard that in so serious a light as some persons appeared to do, for by the last returns of inhabited houses the increase had been greater than the increase of the population; but, at the same time, the houses were not of the kind wanted, nor were they in the proper situations. They were getting farther from the great centres of employment. They wanted dwellings of the right kind in positions suitable for the working men who were to inhabit them. If a working man had to walk two or three miles to and from the scene of his labour, this was in itself a great loss to his employer, and the value of his work was depreciated. Independently of the question of health, the employer was interested in having his workmen located near the site of their employment. At the present time houses were being built at a rate which was never known before. The metropolis was extending in a marvellous way. Still with all this increase of accommodation we were lamentably deficient in proper dwellings for the class who were at the base of all the prosperity of the country.

The vote of thanks was then passed and acknowledged.

THE CATTLE PLAGUE IN THE LAST CENTURY.

The following is a reprint of the article* on this subject referred to in the chairman's address at the opening of this session:—

(Concluded from Page 171.)

There seems to be a very material error in the regulation ordained in the late acts respecting the prevention of the removal of such cattle as may possibly have been exposed to be infected by the murrain, or to contract contagious matter on their skins from being near other beasts seized with the disease, which error may be productive of great inconveniences if the regulations be duly observed, or raise motives in those whom it concerns for not paying due obedience to the ordinance. This is the too great length of time required when the infection is supposed to be in the neighbourhood, for the purchasers of cattle to keep them before they sell them again. Forty days is the time prescribed, and when all the facts from which the determination of the proper period must be deduced are duly weighed, it will appear to be at least two-thirds longer than is necessary. The only reason that can be assigned for the expedience of a restriction as to the time of selling cattle in those cases is, that the seller may be able to give such a certificate to the buyer as affords the best assurance possible that the beast has not taken the infection, nor is likely to convey the contagion by any infectious matter adhering to its skin, though not affecting itself from any diseased beasts it may have approached to others which may come

* The paper is entitled "Observations on the Murrain or Pestilential Disease of Neat Cattle: the Means of Preventing the Infection, and the Medicinal Treatment of the Beasts when seized with it," and is by Mr. Robert Dossie. It is extracted from his "Memoirs of Agriculture," Vol. iii., 1771.—ED. *J.S.A.*

near it. This period of forty days is allotted because such a certificate could not be made by the owner unless the beast had been long enough in his possession to show it had not been infected before it came into his hands, and to afford time for the infectious matter, if any had been contracted by its skin, to have lost its virtue or been worn off, and because it was presumed a less space of time would not have been fully sufficient for this effect. As to what respects the having actually received infection, forty days possession is much longer than is needful to manifest whether or no such infection was taken by the beast before he came into the seller's hands, since the symptoms would have shown themselves, and the beast would have died of or recovered from the disease long before half that time was expired.* As to what respects the contagious matter that may be contracted by the skin of the beast from others infected, the time in which such matter may lose its contagious power, or the skin becoming free from it, cannot possibly be ascertained, and there is reason to believe it might go much beyond forty days, but there are easy means to be employed of taking away the hazard of conveying the disease to other beasts in that way, with far greater certainty than can result from the waiting even a much longer space than forty days without the use of such means.

The time in which the symptoms appear to come on in the murrain after the taking the infection is, as we have above observed, almost generally on or before the fifth day.† But as there may be, though rarely, a variation that requires some latitude we may rate the longest time to be the seventh day. In a very few beasts, however, which have the disease in the most mild and gentle manner, we may also allow time for the aggravation of the symptoms, till they become strong enough to be so clearly perceptible as to leave no room for doubt, and suppose in those instances they may not be very observable till the tenth day. But this is the utmost concession as to the extension of the time in which the infection can lie concealed without sensible effects, that facts will admit us to make, and if no appearances of the disease be found at or before that period it may be very safely concluded the beast had not taken the infection before the commencement of such time. If, nevertheless, we should go somewhat further to satisfy all scruples as to the inaccuracy of these observations, and stretch our caution to the utmost that can be deemed reasonable, the keeping the beasts twelve days after they are purchased is fully sufficient to determine with the most positive certainty that they were not infected before such purchase. There cannot be the least reason, therefore, to keep the beasts longer than twelve days before they are sold in order to avoid the hazard of their having received the infection before they came into the hands of the owner.

The other more specious reason for restraining the sale of cattle during so long a period has not, at the bottom, a more solid foundation in the reality of facts than the preceding. No precise limits can be assigned to the time that beasts, having the infectious matter of the murrain lodged on their skins in consequence of having come near beasts seized with disease, may communicate it by that means to others.

The contagious matter will preserve its infecting quality for a long space of time, as we have reason to conclude, as well from facts respecting the transmission of it into distant countries, and some experiments regarding inoculation with it, as from its analogy to the variolous matter of the small-pox, which retains its virulent power for many months. There is room to conclude that the contagion of the murrain has been conveyed by the raw hides of beasts, in particular, to places where it has taken effect at a considerable space of time after its production; and if it can be so preserved in the skins of dead beasts, why not in the hair of those which are living? It must be granted, indeed, that in the skins of the living it is more exposed to be accidentally carried off than in those of the dead; but there is no certainty, nevertheless, that it will be entirely cleansed away thus under a long time. Even forty days, therefore, do not give a security against the danger of a conveyance of the infection that way, where beasts are removed from the diseased cattle to the sound. I am aware, it will be advanced, in contradiction to this, that the skin of a living beast being exposed to the air, the contagion will be dissipated in the forty days, and not preserved, as in the parts of the hides of dead beasts, to which the air may not have had a like access. But I deny the truth of the principle on which this conclusion depends. It has, I grant, been a prevailing notion, borrowed from ancient writers, and delivered down by those of succeeding times without any examination of the relative facts, that the contagion of the febrile diseases resided in volatile effluvia, which exhaled in the air, and flew off in a short time from bodies that had received them. There is not, however, in reality a greater error subsisting than this established notion. Many experiments on the variolous matter have evinced the contrary by showing that it will keep its virtue, and serve for the purposes of inoculation, for a great length of time, though exposed to the air, provided it be defended from excessive cold, and such moisture as would render it mouldy. A less extensive field of observation, but sufficient to verify the principle, confirms to us that the analogy holds good as to this point, on the contagious matter of the murrain, and others of a similar nature. If, therefore, the virulent matter will not with certainty be taken off by accidental means from the skins of beasts, nor lose its infecting power by exposure to the air under a long time, the preventing for forty days the communications of cattle whose skins may have some

* It appears, from the experiments made at Utrecht in 1769, as above-mentioned, and from others of the inoculation of cattle for the murrain, that the longest period in the case of beasts so treated betwixt their receiving the infection and their death was not more than fourteen days. The observations on the same period, with relation to such beasts as have taken the disease from others without inoculation where it could be ascertained by the known time of their coming within the reach of the infection, show the longest extent of it in such cases to be about seventeen days. But this must be understood to be according to the course of the disease in Holland. For in our country the death of the beasts taking the disease naturally was found to happen almost always within twelve or thirteen days after the infection, the crisis or turn of it, as we remarked before, being about four or five days earlier here than in the United Provinces. It must be comprehended, also, that this period of death regards beasts which are carried off by the murrain, considered as an acute disease, for where they die, after their recovery from the proper symptoms of the distemper, of ulcers or abscesses in the viscera produced by it, no regular period can be fixed on, as those accidents or their consequences differ in every subject where they happen.

† There is a remarkable uniformity in the operation of the contagion of the murrain as to the time it produces sensible effects when communicated by exterior infection. In the above-mentioned experiment made at Utrecht twelve cows were put to six others that were inoculated, and kept with them in a confined place from the time of inoculation. The twelve were all seized with a cough and gnashing of their teeth the seventh day after the inoculation of the six, and did not exhibit the least difference in the period of their being affected by the infection, which may be concluded to have been taken five days before, as at that time, though it was but the second day after the operation, febrile symptoms began to appear in some of those inoculated, one of which, indeed, was so weak on the third day that she fell down, and had not strength to rise again. The same uniformity is not in the least found in the inoculated beasts, but in most of them the symptoms come on with much more celerity and violence than in those which have the disease by casual infection. Many other facts confirm this observation of the almost constant equality of time in which the visible effects are produced in the cattle which have the murrain by natural means, and they leave us no room to suspect the infection ever lurks after it is taken without revealing itself more than six or seven days, even where its action is the weakest.

share of it on them, with any others, is not a full security against their conveying the infection, if afterwards they be suffered to mix with the sound. The establishment of this species of quarantine or prohibition of removal for forty days is consequently insufficient to the end in that view. But, besides the uncertainty of its effects, and the great inconveniences to particulars it may produce, it is less proper and expedient in this intention, because there is another method by which the same end may be answered in a much more easy and effectual manner. The method I mean is the cleansing the beasts by artificial means, which should always be practised where there is the least danger of their transmitting the contagion from those infected to the sound without having taken the disease themselves. This may be commodiously and efficaciously performed by scouring the skins of the suspected beasts by a proper brush with fine sand and water, and afterwards thoroughly washing off the remainder of what may adhere by water and a mop. By these means the skin of any beast will be more perfectly freed from infectious matter that was lodged in it than by the accidental wearing off in a very long space of time; and if it be duly executed there can be no reason to put the sale of cattle under any restriction on this score. The practice of it should, however, be strictly enjoined by authority, if the time of restriction of sale be reduced as proposed, and the performance of it should be also made a part of the matter of certification.

As twelve days appear, from the above-given reasons, to be fully sufficient to show that beasts have not received the infection before, and as the keeping them much longer is not so effectual a means of taking away the hazard of their transmitting the disease by contagious matter adhering to their skin as artificial cleansing, the term of forty days' restriction from sale ought most evidently to be changed to that of twelve days, which saves more than two-thirds of the time. This shortening the term will be found a matter of very great moment, if ever the occasion for such a restriction shall again offer. The great inconveniences and embarrassments that would attend the obligation to keep cattle, however detrimentally to the owner, for so long a time as forty days, would, if it were largely extended, besides the injuring individuals, conduce, along with the other necessary regulations respecting the removal of cattle, to the causing a scarcity of them in the London markets, and others which are supplied from distant places. But, what is of still greater consequence, the loss and trouble that would result from it to individuals in some cases would furnish such motives for a non-compliance with the injunction as would in all probability defeat the intention of it. It therefore highly merits the consideration of those on whom the direction of this matter depends to weigh well the premises, for a few failures of obedience to the orders of council respecting this restriction may render them wholly ineffectual.* There is no maxim more true than that a law of this kind should be void of everything strongly repugnant to its own operations, or it will prove a dead letter.

To evince more forcibly the extreme great consequence of guarding against the introduction of the murrain into our country, I will here subjoin an account of its late effects in the United Provinces, whence the deplorable havoc it makes there will appear in the most striking manner. The source of the information respecting the facts I shall advance is the registered lists* of the cattle in the south and north divisions of Holland, which I shall incorporate, and these provinces taken together are nearly equal to one-half of the whole United Provinces. In order to give this account in the most clear manner consistent with brevity, I will enumerate all the particulars of the state of the cattle for the nine months preceding the 1st of July last, because they are completely exhibited in the registers during that terms. To this I will annex the total numbers of those that died and recovered in one year, commencing the 1st of April, 1769, and also the number which died and recovered in each of the three succeeding months, as this latter detail leads to some as well curious as useful conclusions:—

Persons keeping cattle in South Holland and North Holland during the term of nine months, commencing the 1st of October, 1769	17,379
Cattle in the possession of those persons during that term	224,999
„ infected with the murrain	141,273
„ died of the murrain	98,995
„ recovered after taken the infection†	39,613
„ escaped the infection	77,850

* It may be speciously said that in a case of so much moment as the prevention of the murrain, the interest of particulars must give way to the good of the public, that it is best to err on the safe side by taking a full scope of time, which has been deemed forty days, to render the matter entirely clear, and that if the cleansing be a further security it should be added to the restriction of sale for that term. This way of reasoning must be allowed to be right as to the general principles, and ought to be adopted where the facts give just occasion for it, but it fails in that point to be applicable to the present case. The extending the length of time of the restriction so much as forty days does not render the effect of the prohibition more certain, but evidently the contrary. It is shown above that if the cleansing be put in practice along with it twelve days will be as effectual as forty, and there is a great probability, when the time is not required to be longer, it may be complied with, there being few cases where it would then be considerably detrimental to the owners of the cattle. Whereas there is the strongest reason to apprehend the longer term would not be generally complied with, and therefore the ordaining it must counteract its own purpose, as the security proposed from it wholly depends on a general conformity to it. When obedience to any matter ordained is enforced by a penalty such penalty will ever fail of its full effect when the gain accruing from disobedience is more than equivalent to the risk of the forfeiture, as we daily see in the great multiplicity of contraband trade. But this principle must hold good still more strongly here where numbers of persons are unavoidably subject to loss without a disobedience than were, as in the case of smuggling, the occasion of it arises only from a voluntary pursuit of profit. The obliging people to keep their cattle so long as forty days when the injunction suddenly and unexpectedly takes place in cases when they are not provided with fodder to maintain them, nor possibly may be able to procure it without the most distressful difficulties, or where they may lie under a necessity of selling the beasts to raise money they instantly want, will of course create temptations to risk the penalty that can scarcely be withstood by the weaker part of those who may lie under these circumstances. Whence it is both against reason and observation to form expectations of a general conformity to such an injunction. But if the chance of the loss and inconvenience that may casually attend the keeping the cattle be almost wholly taken away by reducing the forty to only twelve days, the motives will be proportionably removed for running the hazard of incurring the forfeiture by a non-compliance with what is required, and there is just ground to hope that the regulation would be then fully effectual.

* The copies of these lists did not come to my hands till after most of the foregoing part of this dissertation was printed, otherwise I should have made use of the contents of them in support of several matters I have advanced there, which the inferences to be drawn from them greatly tend to confirm.

† It may be inferred from this account that considerably more than half of all the cattle in the United Provinces took the infection of the murrain in nine months, and that almost two-thirds of those which were infected died. The number, both of those which caught the disease and of those which were carried off by it, is proportionably far greater than was found here, while the disease raged most, and even than has been usually known in Holland, at least one-half of the infected having generally recovered. This evinces the present excess of power in the predisponent cause, or disposition of the cattle to be affected, and verifies by glaring facts what I ventured to assert relating to it, from theoretic reasons, in the foregoing part of this dissertation, which was printed some months ago, before I had any particular information respecting these facts, and, indeed, before the report of them could be made and registered.

Cattle died of other diseases and casualities....	6,488
„ remained ill of the murrain at the end of the term	2,053
Cattle infected in the term of a year commencing the 1st of April, 1769	210,819
„ died of the disease during that term	159,128
„ recovered in that term	61,691
„ infected in the summer season of that term, commencing the 1st of April and terminating the 30th of September, 1769	86,423
„ died in the summer season	63,281
„ recovered in the summer season	32,142
„ infected in the winter season;* commencing the 1st of October, 1769, and terminating the 30th of April, 1770	134,696
„ Died in the winter season	95,947
„ Recovered in the winter season	38,749
„ Infected in the term of three months preceding July, 1770.†	3,912
Cattle Died in that term	3,048
„ Recovered in that term	864
„ Died in April of that term	1,254
„ Died in May	1,325
„ Died in June	469
„ Recovered in April of that term	452
„ Recovered in May	303
„ Recovered in June	109

It appears from the finance accounts that the province of Holland, if the two divisions of North and South, from the separate lists of which this account is formed, be taken together, may, as was before intimated, be considered as one half of the Seven United Provinces, at least with respect to the cattle. So that if we admit the supposition, for which there is good ground, that the ravage made by the murrain was nearly the same in the other six provinces as in that, we may conclude that the loss of cattle destroyed by it in the whole was not less, in one year commencing April 1st, 1769, and ending March 31st, 1770, than three hundred and eighteen thousand beasts. And there is little room to hope from appearances that the disease will be less violent this year than it was the last.

If we reflect that this immense loss is, in some degree, annual at present in the United Provinces, we cannot but deem the being afflicted with the murrain a most deplorable calamity, and this uncommonly strong prevalence of the contagion there ought to be equally an object of our dread as of our compassion. It shows a very great predisposition in the cattle to be affected by this disease, and that predisposition is owing to causes which, from their very nature, are extended over all the neighbouring countries in some proportion, as is further manifested by the actual progress the contagion is now making in parts where there is no epidemic or local cause in the cattle of the susceptibility of the infection. We see, by his Majesty's late proclamation, that it has passed into Flanders, and in now spreading thence to the adjacent countries of France,* where there are no unfavourable circumstances, as in the United Provinces, for the beasts to be more particularly subject to the disease, unless, in common with those of the neighbouring countries, from the accidental influence of bad seasons. This cause subsists alike with us, and we are equally exposed to all the mischievous consequences of the contagion if it be introduced into our island, which, without the greatest care in the exercise of due preventive means, is extremely liable to

* The number of cattle infected in the winter is, in this account, above two-fifths more than in the summer. The reverse of which appears with respect to the plague in the eastern countries, where the contagion of it, for the most part, ceases, or at least greatly abates in that season. But the principle whence this seemingly great variation arises does not, nevertheless, lie in the nature of the diseases, nor even in that of the predisponent cause of infection in the subjects, which is in fact the same in both, but in the local difference of circumstances with respect to the production of that cause. It is the weakness of the subject in both cases that constitutes the susceptibility of infection, and that weakness is induced in different seasons from each other by a diversity in the climate and other circumstances attending the places in which the respective disorders, as here compared, prevail. In those eastern countries where the excess of temperature lies in the heat of the summer, mankind, the subject of the plague, are in a too relaxed state, and the juices so putrescent in many individuals as to render them much weaker than in the winter, which is there mild and salutary. In the United Provinces, on the contrary, the excess is in the cold of winter, which, being attended with great moisture in the air, makes the cattle the subject of the murrain much weaker than in summer, to which the housing them, as is there practised from necessity during that season, much contributes. The increased violence of it in winter and remission in summer did not subsist here while the disease prevailed in our country in any proportion to what it now does in Holland, the less damp state of the air, and the keeping the cattle more out in the fields, having prevented them from being weakened by the inclemency of the winter as there. On the contrary, this was so far from being the case, that Dr. Legard says, "This disease being a contagion of the pestilential kind, is susceptible at all times and seasons. In autumn and summer it will rage most, in spring and winter least, according to the alterations commonly happening in those seasons." He carried it much too far, as is evident by the facts here exhibited, in saying generally the disease will rage most in summer and least in winter, but he spoke from theory only. For supposing, as he intimates, the murrain to be analogous to the plague, he concludes the same effects would always attend the contagion of both without considering the predisponent cause on which the operation of it depends may vary in different places. A more close inquiry perhaps into the course of the distemper here would have prevented this error. The whole, however, concurs to demonstrate there is no intrinsic difference in this point betwixt the contagion of the plague and that of the murrain, but that the variation of the effect of them depends on the variation of circumstances respecting the predisponent cause in different places.

† The number of cattle infected in these three months is only in the proportion of about an eighteenth-part of those in the winter season, and yet of them near four-fifths died. These beasts may, therefore, be presumed to be such as laboured under some constitutional or other peculiar cause of weakness, from which the favourable temperature of the weather could not free them. In June the number infected was not one-sixth part of that of either of the two preceding months, nor consequently in the proportion of so much as one-hundredth part of those of the winter season, the number which died were, nevertheless, still more in proportion than in two preceding months. This evinces that the heat of the weather, though favourable to the beasts in health as to preserving them from infection, was injurious to those whose weakness made them take it, which may be easily accounted for from the greater tendency that the animal fluids have to putrify in hot seasons. Whence it may be inferred that it is not a greater disposition in the humours to putrify independent of weakness, which causes the susceptibility of infection, but weakness only; and that, therefore, unless the degree of this disposition be such as induces weakness, it does not contribute to the reception of the contagion though to its stronger operation when received. This confirms what I have above advanced, that putrescence has not primarily any concern in the cause of the murrain, but in the consequences of it, as being either before subsisting or produced by the operation of the infection, it aggravates the fatal effects as a secondary cause.

* This rapid progress of the contagion, and extending of its effects into places where it spontaneously extinguished a considerable number of years ago, and has never before revived since, is, together with the great epidemic prevalence of the disease in Holland, displayed in the above-given account, a strong confirmation of the truth of the principles, whence I formed a judgment *a priori* of the present susceptibility of the infection in the cattle throughout all these parts of Europe. As my prediction relating to the consequences of it, given in the foregoing part of this dissertation, is verified by these facts, which have happened since the printing it, the certainty of those principles ought to excite the greatest apprehension of our danger from them, and the most powerful motives for our very earnest attention and care to guard against this menacing evil.

happen from the proximity of the place where the infection now prevails, conspiring with the susceptibility of it that attends the cattle at this period. It therefore highly behoves every individual to exert his utmost endeavours, according to his situation, to avert this impending danger of one of the most heavy calamities that can befall any European country, and more especially our own, where the luxurious habits of the common people, the difficulty of obtaining a supply of cattle from other places, and the high prices of the necessaries of life, would render the effects of a scarcity of horned beasts, and consequently all other provisions, peculiarly grievous and intolerable.

Manufactures.

Nitroglycerine for Blasting.—The *Berg-und Hüttenmännische Zeitung* states that among other disadvantages of Nobel's nitroglycerine is the fact that it freezes at a temperature very probably above 92° Fahr. It is said that even at a temperature of 43°—46° Fahr. the oil solidifies to an icy mass, which mere friction will cause to explode. It is probable, however, that the freezing point of the oil lies somewhat lower than is here stated, though as yet no exact determination of the freezing point of the oil has been made. A newspaper from Hirschberg, in Silesia, gives a sad account of an accident caused by the frozen oil exploding by friction. Nitroglycerine is there being used in making a railway tunnel. It was kept in glass vessels, packed in straw and placed in baskets, each vessel containing one-fourth to one-eighth of a hundredweight of the oil. For several days the oil had been frozen. It was carefully handled, and pieces were separated by means of a piece of wood and put into the bore-holes, and it was found that the frozen nitroglycerine exploded quite as well as the fluid. One day an overseer at the shaft hit upon the unlcky idea of breaking into pieces with a pick a seven or eight pound lump of the frozen nitroglycerine. The blow caused the mass to explode, and the unfortunate man was blown up into the air, and fell back into the shaft, some forty or fifty feet deep, whilst two workmen who were making cartridges a short distance from him luckily escaped with slight injuries.

Publications Issued.

The Homes of the Working Classes: Suggestions for their Improvement. By James Hole, Honorary Secretary to the Yorkshire Union of Mechanics' Institutes; Author of "The History of Mechanics' Institutes"; "On the State of Education in Leeds," &c. (*Longmans.*)—This work is published under the sanction of the Society of Arts, who, in 1853, awarded to the author the Society's Medal and the Premium of £50 offered for the best Essay on the History and Management of Literary, Scientific, and Mechanics' Institutes. The present work is dedicated to Edward Akroyd, Esq., M.P. It will be remembered, that in the year 1864, the Society of Arts held a conference on the subject of the "Dwellings of the Working Classes," to which representatives of the Institutes in Union with it were invited. The committee of the Leeds Mechanics' Institution, feeling the importance of the question, decided to aid the discussions by the experience of their own town. The Mayor of Leeds (J. D. Luccock, Esq.), as President, offered a prize (ultimately awarded to the author) for an essay on this subject. This essay was publicly read in January, 1865, and its publication in the local newspapers at the time directed public attention to the sanitary condition of a large portion of the dwellings of the working classes, and to the moral evils connected therewith. Since then the scope of the essay has been enlarged, so as to form the present book. The facts relating specially to Leeds have been transferred to the Appendix, and the experiences of other towns have been given. The experience of the writer, as director of a large building society, and as a member of the Leeds Model Cottage Association, has given him some insight into the various difficulties with which this topic is surrounded. The work treats of the principal causes of the bad state of the dwellings of the poor, and gives the proper conditions for rendering their dwellings healthy; it speaks of the undue mortality of the poor, and the pecuniary loss thus caused to the community, and touches upon the various moral evils caused by the present state of things; the neglect by local authorities, and the means of preventing this; the evils caused by the smoke nuisance and by the building of houses back to back, as well as other questions of a similar character, are treated of, and the author then proceeds to give descriptions (illustrated by capitally drawn plans and elevations) of many of the principal model dwellings that have been erected or recommended. The advantages of building societies; the means of removing impediments to the acquisition of building sites; and the influence of small freeholds, are among the subjects treated of in this work, which will doubtless be read with interest by those, now becoming a numerous class, who feel that this subject is one of the great questions of the day, and who are anxious to apply some really efficient and effectual remedy for the present state of things.

Forthcoming Publications.

A Descriptive Treatise on Mathematical Drawing Instruments, their construction, uses, qualities, selection, preservation, and suggestions for improvement, with hints upon drawing, colouring, and drawing material, by *Wm. F. Stanley*, 5, Great Turnstile, will be published in March, price 5s. The above work will contain a description of all the drawing instruments in general use, also the best instruments to be employed for producing every description of geometrical form, as the ellipse, helix, parabola, conchoid, arcs of high radii, geometrical ornaments, &c., with many important and popular instruments, of which an adequate description has never appeared in print, as the ediograph, centrolinead, computing scale, geometrical pen, &c. It is to be illustrated by over two hundred engravings, especially prepared.

Notes.

Lighting the British Museum at Night.—"A Gasman," writing to the *Times*, says:—"There could hardly be a building more unsuitable for being generally lighted at night than the British Museum; but this admission certainly does not apply to the reading-room, which could be easily and safely lighted from the outside; and when it was first proposed for construction I heard a very high authority advocate its building, and its very mode of building of iron and brick, on the very ground that it could be lighted for evening use without the slightest risk. The light would be from a top lantern outside. Then there are proper precautions for cutting the reading-room off from all the rest of the building; and I feel satisfied that Mr. Panizzi, had he remained in office, would have advocated its being lighted. Readers would have to be satisfied with books deposited or brought specially into the reading-room during the day. And what a boon it would be to students of all classes!"

Correspondence.

The System at South Kensington Museum.—Sir,—The lateness of the discussion on the 24th ult. prevented me from replying to my excellent friend, Mr. Chester, who said, "If Mr. Cole were succeeded by an obstructive the system would not be found the best in the world." No doubt an obstructive may damage any system; but if there be one system which is better than another it is that which makes clear who the obstructive is, and that he *is* an obstructive: and the system at South Kensington does this, because in it the responsibility is clear and well defined. Parliament has a responsible minister who can be made to answer for his subordinate, and if this subordinate be an obstructive Parliament can insist upon his removal. The system of "single-seated responsibility," as Bentham called it, is the only one which affords a quick means of remedy. If Parliament does not complain, and the public do, then it is the work of the public to make Parliament listen and act. The master in Russia thrashes his coachman when he wants him to get on, and the coachman flogs the horse, and thus the machine moves forward. So at South Kensington. Parliament can thrash the responsible coachman, and the coachman can flog the secretarial stud; but all this is unattainable under any board or other system of that character.—I am, &c., Henry Cole.

Museums and Public Galleries.—Sir,—Permit me to contrast the statement that "Professor Owen had proposed a museum which would cover ten acres (that was what he stated before the House of Commons)" —*Journal of the Society of Arts*, No. 688, p. 166), with the following facts:—In the "Parliamentary Return," 11th March, 1859, a "plan" is appended, which "I desired to be understood as designed merely to convey to the eye the relations of the assigned galleries to the several departments and classes of natural history," in order "to illustrate a calculation of the proportionate space which should be allotted to each department and class in a national collection, with a view to probable additions to the present collection for thirty years to come."—(p. [illegible]) In the "Parliamentary Report on the British Museum" of 10th August, 1860, "Minutes of Evidence" (p. [illegible]), I am asked:—"*Q.* 538. How much space altogether does this plan of 1859 require?—*A.* If the [illegible] architecture involved two stories, it would require, in respect of exhibition of specimens, five acres." The same amount of space is testified to in my replies to questions 555, 572, 590, 596, and finally to 647,—(By the Chairman.) "You want five acres for your own department, as I understand?—*A.* Yes." But then I stated that I wanted this amount of space, not for a "five-acre museum," but for ground on which future extensions to the "two-and-half-acre museum required for present collections" might be made. In reply to question 553, I state [illegible]ly, "I do not contemplate the immediate carrying out of such plan. I suppose that if we were to proceed [illegible] our collections at the ratio at which they have been increasing for the last ten years, in thirty years from the present time such a building as this would, on that basis, certainly be required." The "Plans and Sections of a Museum of Natural History," ordered by the House of Commons to be printed in the "Return of the 25th June, 1863; the "premiated designs" for a museum of natural history, by the late lamented Captain Fowke, R.E.; and the "plan" by Prof. Kerr, adjudged second in degree of merit, severally meet the views entertained by the late Mr. Puller, M.P., as to [illegible] the requisite exhibiting space in a building of [illegible], "ultimately extending over five acres."—([illegible] 729-733.) This forecast of space relates to [illegible] (*Journal of the Society of Arts*, p. 160) [illegible] H. G. Lennox, M.P., of the main end of a [illegible] museum of natural history, as given in reply to *Q.* 632: — "Do you think that the object of the British Museum is to provide people with amusement or with instruction?—*A.* With both, secondary to the main end of a national collection, viz., to exhibit 'series of created works;" and, in replying to a similar question (No. 524), "to give such a view of the works of creation as might be reasonably expected in the museum of a great nation." Doubtless, to "amuse," a selection of specimens remarkable for colour, shape, or size, would suffice; and, to "instruct," a selection of specimens, illustrative of the elements of natural history, as the science exists, would also suffice. For either of these purposes Parliament need not be called upon to provide such accommodation as I have estimated for and recommended. A famous Englishman, who wrote a book "On the Advancement of Learning," complained that the ways and means thereof had been, up to that time, exclusively for "amusement" and "teaching," not for "augmentation of science;" and he gives rules for the latter object, from which the world has derived some profit. In regard to natural history, Bacon notes as needful and deficient in his day a national museum of the kind, viz., "of all sorts of beasts and birds, not only for view and rareness, but likewise for dissections and trials" ("New Atlantis," quoted in my Address to the British Association, 1858); and for the aim which, to the bewilderment of some minds, I have testified to be the chief. For to add to old truths that most precious of all acquisitions, new truths, it is essential to the cultivators of the various branches of natural history to have at command as complete a series of natural history objects as can be acquired; and such completeness can only be had or expected in the museum of a nation. For the full development of the idea, I must refer (not to trespass unduly on your pages) to my "Discourse on the Extent and Aims of a National Museum of Natural History," 8vo., 1862. Why, after such repeated and explicit published statements of my views, I should continue to be misrepresented, I know not. To gain a verdict an advocate may make a telling point, as by masking the truth behind the cry, "a ten-acre museum;" but this is not business-like, and the question at issue merits other treatment.—I am, &c., Richard Owen.

January 30th, 1866.

Trade Marks.—Sir,—I have read with much interest Mr. Henry's sensible letter on the subject of the law of trade marks, and certainly the necessity for further legislation on that subject, in the direction of the establishment of a registration system, and the enforcement of rights as to registered trade marks—by some means less transcendently moral and "draconic," as he aptly terms it, than the Merchandise Marks Act (1862) has provided for trade marks without registration —are subjects that all who bestow any thought upon the matter will readily recognise as of great importance. Having been called upon to deal with the practical application of the Act referred to, I have found that its very character, as a highly penal and strictly criminal piece of legislation, is, in reality, an objection to its general adoption; for, except in such cases as those in which, from long-continued usage, a man's right to a particular trade mark as his peculiar means of denoting articles of his manufacture or in which he trades, is clearly established—it is open to serious discussion as to whether such particular mark is so well defined and distinctively appropriated to him that another man, who may adopt a mere imitation of it, can be shown, with that undoubted certainty required, and very properly required, by our criminal law, to have wilfully invaded some right specifically vested in some known individual, so as to place a person complained against in the same category as a criminal wrongdoer only one remove from an ordinary forger. The Court of Chancery, it is true, can and does afford the means of remedying improper invasions of trade marks without regard to proof of any criminality in the invading parties, but I apprehend that the expense of a Chancery suit must always be a great drawback to the utility of this kind of remedy. If all trade marks were registered,

and every one unlawfully using a registered trade mark after notice were subjected to a fine of moderate amount, and to the confiscation of the dies and means of producing marks unlawfully, at the requirement of the parties registered as exclusive possessors or adopters of the marks, and without entering upon any question of criminal intent—a simple and effectual means of preventing the piracy of merchandise marks would be available for the protection of manufacturers and traders — it being understood that the Merchandise Marks Act, 1862, and the Court of Chancery should still be open, where needful, after due registration of the mark.—I am, &c.,

F. W. CAMPIN.

Temple, January, 1866.

MEETINGS FOR THE ENSUING WEEK.

MON......Society of Arts, 8. Cantor Lectures. Mr. Fleeming Jenkin, F.R.S., "On Submarine Telegraphy." (Lecture II.)
Entomological, 7.
Medical, 8.
R. United Service Inst., 8½. Mr. W. Saunders, "Gunpowder, and Gale's plan for rendering it inexplosive."
Farmers' Club, 5½. Discussion on "British tillage, present and future."
Society of Engineers, 7.
Odontological Society, 8.
Royal Inst., 2. General monthly meeting.

TUES....Civil Engineers, 8. 1. Discussion on "The Craigellachie Viaduct." 2. "The Grand River Viaduct, Mauritius Railways."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Professor Tyndall, "On Heat."
Geologists' Assoc., 7.

WED.....Society of Arts, 8. Renewed discussion on Mr. Hawes' paper "On the Proposal that the Railways should be purchased by Government."
Geological, 8. 1. Mr. W. T. Locke Travers, "On the Mode of Formation of the Lake-basins of New Zealand." 2. Mr. Robert Dawson, "On the Occurrence of Dead Littoral Shells in the bed of the German Ocean." 3. Mr. T. F. Jamieson, "On the Glacial Phenomena of Caithness."
Pharmaceutical, 8.
R. Society of Literature, 4½.
Archæological Assoc., 8½.

THURS...Royal, 8½.
Antiquaries, 8½.
Royal Society Club, 6.
Royal Inst., 3. Prof. Tyndall, "On Heat."

FRI.......Astronomical, 3. Annual meeting.
Royal Inst., 8. Mr. Archibald Smith, F.R.S., "On the deviation of the compass in iron ships."

SAT......R. Botanic, 3¾.
Royal Inst., 3. Prof. Westmacott, R.A., F.R.S., "On Art Education."

Patents.

From Commissioners of Patents' Journal, January 26th.

GRANTS OF PROVISIONAL PROTECTION.

Breech-loading fire-arms, &c., cartridges for—137—E. M. Boxer.
Bridges—47—W. Clark.
Copper and nickel ores, treatment of—86—G. Chetwynd.
Fabrics, looped or knitted—111—W. Comery and H. Webster.
Felt hats—147—W. C. Mann.
Fibres and tissues, bleaching—84—R. A. Brooman.
Fire bricks—155—C. J. Crondace and J. Field.
Flasks, bottles, &c.—60—F. Wise.
Friction matches—3383—W. E. Newton.
Furnaces—80—E. B. Wilson.
Furnaces, charging—6—W. Barningham.
Gas-burners—133—G. White.
Grain and seeds, assorting—55—J. Kerridge and W. Peverett.
Harvesting machines—117—C. S. Baker.
Hydraulic presses—161—E. Cottam.
Hydro-carbon oils, treating—3345—J. Young, jun.
Kitchen stoves and ranges—3144—G. F. Russell.
Lamps—113—W. R. Lake.
Leather, utilization of waste—3054—A. V. Newton.
Liquids, measuring—93—J. C. Angus and G. Stuart.
Motive power, obtaining—62—E. Perré.
Moulds for casting in metals—56—A. Gibb.
Nail and brad cutting machine—74—J. Sadler.
Photography, finishing impressions produced from plates by—105—W. B. Woodbury and G. Davies.
Pile shoes—99—W. Eassie.
Power looms—28—R. Willan.
Printing—73—A. Leighton.
Railway and tramway carriages, breaks for—67—J. M. Macrum.
Railway carriages, stopping or retarding—2595—G. Voight.
Railways, preventing accidents on—149—W. Lyne.
Railways, securing the rails of—82—J. Clutton.
Railway wheels, moulds for casting the tyres of—103—J. T. Smith.
Rice starch—88—J. W. Gray.
Rotating motion, producing—3272—J. W. Carr.
Safes—3321—S. Chatwood.
Saws, grinding—3223—G., E., and A. A. Atkin.
Sewage, treatment of—101—F. Sutton.
Signalling apparatus—22—W. Buckley.
Spoon rest—3080—J. Roberts.
Spring tops—119—R. A. Brooman.
Steam, discharging the water resulting from condensed—163—J. L. Norton and F. L. H. W. Bunger.
Tape-sizing machines, making leashes in warps for—159—J. Wyld and J. Kershaw.
Tea leaf, treating and curing the—131—F. Campbell and W. Burgess.
Telegraph standards, fencing and signal posts—24—G. S. Robertson.
Temperature, apparatus for recording—76—R. Shaw.
Tetra-chloride of carbon—97—C. Crump.
Textile fabrics, washing, &c., of—64—R. A. Brooman.
Toothed wheels—95—R. Mathers.
Turntable and weighing machine—78—J. Ireland and S. Davies.
Type distributing and composing machines—16—A. and W. Young.
Watches, &c., protectors for—123—H. Gottheimer.
Water-closets and commode pans—135—H. E. Newton.
Weaving, looms for—1—J. Bullough and W. Rossetter.
Weaving, looms for—52—T. Sagar, G. Keighley, J. Clegg, and T. Richmond.
Weights, lifting and lowering—13—T. C. Fawcett and H. Wilson.
Wheels, tyres for—30—T. E. Vickers.
Windlasses—42—E. Walker.
Woven fabrics, printing—151—M. Henry.
Wrench and cutter—68—W. D. Grimshaw.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Wood and marble, graining in imitation of—186—G. T. Bousfield.

PATENTS SEALED.

1961. R. Clayton, J. Raper, and J. Goulding.	2029. H. A. Bonneville.
1972. B. Robinson and J. Varley.	2036. H. Geering.
1991. F. Ransome.	2041. C. H. Simpson.
2007. J. H. Tyler.	2062. H. Cartwright.
2015. E. L. Ransome.	2090. J. Knowles.
2021. W. Clark.	2925. H. A. Bonneville.
	2958. J. R. Cooper.

From Commissioners of Patents' Journal, January 30th.

PATENTS SEALED.

1978. A. Applegath.	2039. J. Petrie, jun.
1988. W. Singleton.	2048. W. Clark.
1990. L. E. C. Martin.	2063. S. and J. Law.
1992. M. P. W. Boulton.	2191. J. Moule.
1996. J. McEwan and W. Neilson.	2197. J. Symmons.
2002. W. W. Burdon.	2210. P. Polain.
2004. C. Hodgson.	2211. A. V. Newton.
2006. H. Allman.	2231. J. H. Johnson.
2008. J. W. Perkins.	2248. W. E. Newton.
2011. W. H. Brookes.	2273. A. V. Newton.
2014. H. D. P. Cunningham.	2286. W. Clark.
2020. A. Sleigh.	2356. W. Clark.
2024. E. Wild and W. Wessel.	2369. H. A. Bonneville.
2025. F. G. Mulholland.	2474. A. Moore.
2034. H. C. Baudet.	2674. C. G. Lenk.
2037. T. Smith and J. Brook.	3106. F. Braby and A. Moore.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

210. F. N. Gisborne.	254. W. Conisbee.
227. J. B. Fell.	270. N. Clayton and J. Shuttleworth.
296. W. C. Barnes.	292. F. G. Grice.
250. C. Mace.	
251. R. Ward.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

216. J. Fowler, jun., B. Burton, D. Greig, and J. Head.	249. H. Rawson.
222. H. Owen	252. G. F. Bradbury & J. J. Ki
224. R. Bodmer.	304. J. Hirst jun., and J. Hollinworth.

Registered Designs.

Part of a Travelling or other like Bag—January 10—4763—Henser, 2, Jewin-crescent, E.C.
The Desideratum Decanter and Jug Cleaner—January 11—4763—Sealter and Co., 4, John-street, Commercial-road-east.
A Perpetual Mouse Trap—January 13th—4764—C. Pullinger, Sels near Colchester.
Improved Joint for a Lefaucheux Action Double or Single Barrel Gun—January 15—4765—T. Turner, Fisher-street, Birmingham
Improved Tri-coloured Signal Lantern—January 19—4766—G. B. Birmingham.
A Waist Clasp Fastening—January 24—4767—H. Foster, Wo bridge-street, City, E.C.
Bezel for Clocks, Pressure and other Guages, and other sim articles—January 25—4768—T. E. Evans, Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 9, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

FEBRUARY 14.—"On the Gas Supply of Paris." By GEORGE R. BURNELL, Esq., C.E., F.G.S.

FEBRUARY 21.—"On Modern Legislation in regard to the Construction and Equipment of Steam Ships." By THOMAS GRAY, Esq., H.M.C.S. On this occasion the Right Hon. ROBERT LOWE, M.P., will preside.

CANTOR LECTURES.

The next lecture of the course, on "Submarine Telegraphy," by FLEEMING JENKIN, Esq., F.R.S., will be delivered as follows:—

LECTURE III.—MONDAY, FEBRUARY 12.

LAYING AND REPAIRING CABLES.

1. *Stowage* on board ship. Water-tanks. Cones and rings.
2. *Break.*—Object, simplest form. Appold's break. Dynamometer.
3. *Theory of Submersion.*—Reference to paper by Messrs. Brook and Longridge. (*a.*) Ship at rest, cable at rest, common catenary (*b.*) Ship at rest, cable in motion. (*c.*) Case of spheres dropped at regular intervals from ship in motion. (*d.*) Motion of an inclined rod in water. (*e.*) Cable paid out from ship in motion without tension at bottom lies in a straight line from the surface of the water to the bottom. (*f.*) Tension on cable when laid taut and slack. (*g.*) Effect of light specific gravity in diminishing tension when cables are laid slack. (*h.*) Angle of inclination and line of motion of cable through water.
4. *Application of Theory* to common iron or steel covered cables; to the second Atlantic Cable, and to a bare gutta percha core.
5. *Proposed improvements.*—Reels, buoys, floats, nippers, elastic arrangements to compensate for rise and fall of ship.
6. *Repairs* in shallow water; grappling or dredging; underrunning; picking up machinery at bows and stern; depths from which cables are commonly recovered.
7. *Repair of deep Sea Cables.*—Proposed methods of recovering second Atlantic Cable; strains on cable when lifted; chance of success.

The lectures commence each evening at Eight o'clock.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement:—

Crumlin (near Newport, Mon.), Mutual Improvement Society.

PARIS UNIVERSAL EXHIBITION OF 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for without delay.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

Proceedings of the Society.

CANTOR LECTURES.

"ON SUBMARINE TELEGRAPHY." BY FLEEMING JENKIN, ESQ., C.E., F.R.S.

LECTURE II. MONDAY, FEBRUARY 5.

SHALLOW AND DEEP SEA CABLES.

The lecturer first alluded to the omission from the first lecture of any mention of the new insulators—balata, Parkesine, collodion, Mr. Mackintosh's material, and others. This omission was an oversight, due possibly to the fact that, as he has been unable to procure a specimen of any one of these materials for examination, he had formed no opinion as to their merits. The value of a new, good, and cheap insulator would be very great. The following is an abstract of the second lecture, under the heads in the syllabus:—

1. *Serving and Worming.*—Strands of hemp or jute are commonly laid or spun round the insulated core to serve as a pad or protection against pressure from the iron wires afterwards applied, and also, in some cases, to form a larger heart, allowing larger and more wires to be applied than could lie round the small insulated wire. This covering of hemp or jute is called the "serving" of the cable. When several insulated wires, to transmit distinct simultaneous messages, are included in one cable, as for short distances is frequently the case, these insulated wires are laid in a long strand, with hemp between them, to form a circular core. This hemp is called the "worming." The worming and serving were formerly tarred for their preservation against decay in water, but Mr. Willoughby Smith showed that the tar temporarily mended small faults of insulation, and might, therefore, conceal an accidental injury to the core; but tar was not so good an insulator as permanently to mend the fault, so that the tar might lead to the submersion of a fault which would otherwise have been discovered and repaired before submersion. To avoid this risk tanned hemp is now used, and is often applied wet, to increase the chance of at once detecting any accidental iujury to the gutta-percha. Hemp under wires is remarkably durable, and jute also answers well as a cheaper substitute. When hemp is exposed in water it soon decays, and jute decays still more rapidly; both are liable to be eaten by animals where exposed, but not where covered by iron. A specimen was shown where a small quantity of hemp exposed by a kink, at a depth of 800 fathoms in the Mediterranean, had been attacked by a species of teredo; the part immediately adjacent, covered by iron wire, was intact. These animals exist in the Mediterranean even in depths of 1,200 and 1,600 fathoms. In applying the covering, care must be taken that the insulated wire be not overstrained; the simplicity of the work has sometimes led to the use of imperfect machines which might cut the gutta-percha, and to the employment of boys too young to be careful.

2. *Iron Sheathing.*—The served core is commonly protected by iron wires laid round and round in a long helix, and abutting one against another, so as to present the appearance of a simple iron wire rope. This sheathing is frequently called a spiral covering, but the wires lie in a helix, not a spiral, which is a curve like that formed by a watch-spring, not that formed by a corkscrew. There is a popular impression that this form of cable must necessarily be very easily extended or stretched; but this impression is wholly erroneous. The single helix stretches by becoming more nearly a straight line, and by gradually closing so as to include a smaller and smaller

TABLE IV.—STRENGTH AND ELONGATION OF CABLES AND MATERIALS.

Part I.—Cables.

(*The Specifications are given at the end of the Abstract of this Lecture.*)

Cables.	Breaking strain in cwts.	Corresponding length in water. Fathoms.	Per cent. of elongation, with one-half breaking weight, per cent.	Per cent. of elongation, with breaking weight, per cent.	Weight per knot in air, cwts.	Weight per knot in water, cwts.	Remarks and Authorities.
1st Atlantic	80	4,979	0·24	0·8	21·70	16·30	Report of Joint Committee, App. 10.
Red Sea	65 to 87·5	3,806 to 5,112	0·16 to 0·34	0·56 to 1·16	21	17·30	Do. do. do.
Malta, Alexandria ...	147 „ 157	4,565 „ 4,874	0·2 „ 0·36	0·5 „ 0·86	42·70	32·73	Do. do. do.
2nd Atlantic	154	11,000	—	2·57 „ 4·65	35·75	14·0	Unpublished experiments by Mr. Fairbairn.
Steel and Hemp coated Gibraltar	102·5 „ 147·5	7,928 „ 11,407	0·62 „ 1·24	1·87 „ 4·06	25·47	13·11	Report of Joint Committee, App. 10.
Iron and Hemp coated	67·5 „ 75	5,346 „ 6,000	0·26 „ 0·77	1·80 „ 3·10	24·87	12·65	Do. do. do.
Siemens' Copper-covered Cable ...	50	6,250	—	0·8	18·61	7·97	Mr. C. W. Siemens' unpublished information.
Allan's Cable	18·37	7,500	—	1·0	8·0	2·5	Mr. Allan's unpublished information.
Ratan and Stretched Hemp	15·75	8,500	0·52	1·56	7·73	1·86	Messrs. Forde and Jenkin's unpublished information.

Part II.—Materials.

Materials.	Breaking strain in cwts.	Corresponding length in water. Fathoms.	Per cent. of elongation with one-half breaking weight, per cent.	Per cent. of elongation with breaking weight, per cent.	Weight per knot in air, cwt.	Weight per knot in water, cwt.	Remarks.
Copper strand, Malta-Alex.	5·75	—	0·22	8·5	3·57	3·125	Report of Joint Committee, Appendix 10.
Core, Malta-Alex. ...	5·75 to 7·5	2,260 to 2,826	0·28	22 to 25	7.15	3·36	Do. do. do.
*Iron Wire, 0·079 in.	4·18 „ 4·5	5,600 „ 6,040	0·12 to 0·18	0·46 „ 0·72	96 lbs.	83·5	Do. do. do.
*Steel Wire, 0·079 in.	8·00 „ 8·50	10,600 „ 11,200	0·28 „ 0·34	1·00 „ 1·80	97 lbs.	84·7	Do. do. do.
Hemp and Iron	5·00 „ 7·43	—	0·16 „ 0·32	1·04 „ 2·46	141 lbs.	—	Do. do. do.
Steel and Hemp	10·87 „ 11·75	—	0·37 „ 0.51	2·28 „ 2·70	142 lbs.	—	Do. do. do.
Hemp alone	2·87	—	—	—	45 lbs.	—	Do. do. do.

* Other specimens of iron and steel would be found to stretch differently. Some iron and some steel would stretch considerably more, and very hard specimens would stretch less. The above results seem to be taken from fair samples.

cylindrical space: if this closing be prevented, for instance if the wire be wrapped round a solid core, the helix will not stretch more than a solid wire; the closing is prevented in the ordinary cables by the arrangement of the outer wires, which abut, each upon its neighbour, so that a cross section of the cable shows a compact iron ring. The tube formed by the wires cannot diminish in diameter, and consequently the helix cannot stretch more than a solid wire; this is proved by the experiments of Messrs. Gisborne, Forde, and Siemens in the "Report of the Joint Committee on Submarine Cables," 1861. Some extracts from their results are given in Table IV. The stretch of the Atlantic, Red Sea and Malta-Alexandria cables before breaking is, as will be seen, hardly more than the stretch of a single iron wire (part II., Table IV.); the slight excess is owing to a slight diminution in the diameter of the cable due to the more perfect closing of the wires one upon another when the strain is applied. Owing to the perfect iron ring formed by the wires, the inner core is not sensibly compressed. A helix may elongate by untwisting as well as by closing in the manner described, and sometimes this defect has been alleged as the only serious one. The total elongation which could arise from this cause is the difference of length between the wire as it lies round the cable and when stretched out straight. This is about 1½ per cent. in the Malta-Alexandria cable; but no sensible untwisting ever does occur; about forty or fifty turns are, at most, taken out per mile, and this would elongate such a cable about eighteen inches per mile, or about 0·03 per cent. When cables are recovered from great depths no sensible change in the lay is found to have taken place. It cannot be seen that they have in any way been untwisted or stretched. Specimens of cable thus recovered were exhibited, and the following experiments shown to enforce the reasoning:—First, half a ton was hung on a light iron cable of the usual form, and it was seen that no stretch occurred, although less than half the weight would have stretched the core inside 20 per cent., and finally have broken it. This proved that the strain was really borne by the rigid helical iron wires outside, not by the core inside. Secondly, weights were hung on a single wire, outside a core of hemp and gutta percha; this stretched a very little. Lastly, an experiment was tried which to all appearance resembled the first, but on the weights being taken off, the rope was bent and opened, and shown to consist of a mere hollow shell of iron wires, without any core whatever inside for eighteen inches of its length. This proved that the iron wires do not press injuriously on the core. In all these experiments the rope was free to untwist, but did not do so sensibly. The experiments were simple illustrations of facts well known to all practically acquainted with telegraphic cables. It may therefore be assumed that the common form of cable is not liable to stretch, but another defect, the liability to kink, has been urged against it. A kink is a loop drawn tight, or a twist in a rope concentrated at one point. Specimens of kinks were shown. A kink may be produced in any form of cable, with or without helical covering, inasmuch as a loop or twist may be produced in any form by mismanagement.

A rope coiled round a drum with one side out may be wound off and rolled round another drum, or paid out into the sea, without receiving any twist, but if, by mismanagement, the rope were pulled off the end of the drum, it would be twisted or kinked. Similarly, if coiled in a tank, with one side always uppermost, although apparently without twist, it would be twisted or kinked when pulled straight out of the hold. In practice these plans are not adopted; the cable is carried down into the tanks from a drum with one side always turned in one direction; let one side of a straight cable be marked black, and let it be coiled into the hold so that the black side shall always be north, then this black mark will, on the north side of the tank, be turned from the centre, at the south side to the centre, at the east and west side it will be uppermost and undermost respectively. The rope thus coiled in will have one twist in it for every turn round the tank; in a spun rope, this twist will twist the rope tighter, or untwist it according to the direction in which the rope is coiled; but in either case when the rope is drawn out of the coil it comes out as it was put in—straight and without twist. The extra turn or twist is caused by coiling, and removed by uncoiling. There is one simple, universal, and sufficient rule to prevent the occurrence of a permanent twist. The cable must be taken out of the tank or off the drum, in the same manner as it is put in or on; the opposite course will always put a permanent twist into a cable, and this twist concentrated at one point, produces a kink. These points were illustrated by elementary experiments with a piece of india-rubber tubing to represent a cable. One side of the tube was painted so that a twist could readily be seen. When a cable is properly coiled in the tank, it is possible, by a severe jerk, so to mis-manage the uncoiling as not to take out the twist regularly, and kinks have thus been caused by several turns being caught up at once out of the hold. This now very seldom happens. Not one kink occurred during the paying out of the Malta-Alexandria, and Persian Gulf cables, or during the late Atlantic expedition, in all about 3,500 knots. Even when a kink does occur, it seldom injures the cable. A specimen was shown, cut from the Dover and Calais cable, containing six insulated wires, through which, kinked as they were, messages had for years been transmitted between England and France. The common form of cables affords a good mechanical protection against injury.

3. *Iron and Steel Wire.*—The tensile strength of a cable is the sum of the strength of the wires composing it. A cable covered with good iron should bear a strain equal to two tons per pound of iron wire per fathom. Thus a cable with 3,750 lbs. of iron per knot, or 3·75 lbs. per fathom, in the sheathing should bear 7½ tons. This rule corresponds to a strength of about 41 tons per square inch. The larger gauges and inferior qualities of iron cannot be expected to bear so high a strain as this. Best Best is the quality most usually specified, but charcoal wire seems to be more permanent than the inferior brands. The wire should in no case be hard or brittle. Bright wire is generally used for the smaller gauges, and black wire for the larger gauges, unless the wire be galvanised. Table V. gives the relative weights per knot of the different gauges, according to Messrs. Johnson, of Manchester. The weight of a wire per knot in lbs. is nearly equal to the square of the diameter in inches multiplied by 16,100, or say 16,100 d^2. The wires are joined by welding and the cables by splicing. These operations require no special description. Welds should not be allowed in two wires of a cable at the same point, or near the same point.

TABLE V.

Showing Weights of Iron Wire of different Gauges.

B.W.G.	lbs. per knot.
00	2066·68
0	1716·48
1	1393·92
2	1212·20
3	1048·32
4	872·80
5	748·80
6	622·08
7	529·92
8	449·28
9	368·64
10	305·82
11	241·99
12	184·32
13	144·00
14	109·44
15	86·40
16	65·66
17	50·68
18	39·16

4. *Sheathing machines.*—These apply the wire with a constant tension, and, so as not to twist it, keeping one side always uppermost, so that if it faces the core below the cable, it will be turned away from the core at the top. To do this each bobbin holding the wire moves parallel to itself. The effect of this arrangement was experimentally shown with the india-rubber tube to represent a wire. The effect of the other arrangement, in which the bobbin moves round the cable fast on a disc, as the arm of a wheel moves round the nave, or as the moon round the earth, was also shown. This arrangement twists the wire. Cables made with twisted wire are weaker and less manageable than those made with untwisted wire.

5. *Permanency of Cables.*—The wires of cables may rust or be chafed through on rocks, or be eaten through by some chemical action other than simple rusting, or they may be broken by anchors. Any motion in the water round a cable much accelerates the rusting away, and chafing depends wholly on this cause. In some bottoms, even in still water or great depths, decay does occur very rapidly, and this must be due to some other cause than simple rusting. Large wires are the natural protection to injury from the causes enumerated. Galvanising also protects the wires from simple rust. In some situations the simple unprotected wires remain wonderfully unaltered, but protection where possible should always be given. Bright and Clark's silicated bituminous compound applied over the wires affords the best protection yet known. The Persian Gulf Cable is coated with it from end to end. To ensure permanency, cables in shallow seas were now laid weighing as much as ten tons per mile with shore ends weighing nearly twenty tons to resist anchors (vide England-Holland Cable, Appendix). Many heavy shore ends were covered with strands of wire instead of simple wires. Mr. Siemens proposed to apply a covering of hemp outside the iron wires and to wrap this round with a zinc armour.

6. *Statistics of Cables in Shallow Seas.*—The total failures of all kinds, in shallow water, excluding cables which had no proper outer iron protection, did not amount to 100 miles. About 2,350 miles have been laid, which worked for some time, but are now abandoned. Of these, 1,400 miles weighed less than one ton per mile, a weight which, for shallow seas, is now known to be absurdly insufficient; these worked for about two years upon an average. 950 miles weighed more than one ton but not more than two tons per mile. The average life of these cables was five years. 5,000 miles are now certainly at work, possibly more; they have already worked upon an average four years and a half; they include one cable which has worked for 15 years, and several 13 years old; but the average is lowered by the long Malta-Alexandria, and Persian Gulf cables, only lately laid. Every one of these cables, except the Malta-Alexandria, not originally designed for shallow seas, weigh more than two tons per mile. The interruptions on the lighter cables are somewhat frequent. On the Malta-Alexandria they have averaged four days per 100 miles

per annum. Even this is not worse than the best land-lines in India, and is ten times better than the worst land-lines in India.

7. *Maintenance and Returns from Cables in Shallow Seas.*—The average cost of maintaining cables of the Submarine and Electric Telegraph Companies has been for some years from £8 to £9 per mile, excluding the cost of total renewals, which should be provided for by a reserve fund. The expense of the Malta-Alexandria repairs is not known. This line has earned as much as £3,000 in one week, or at the rate of £117 per knot per annum. In one year the average earnings during the time it was open were at the rate of more than £90,000, or £68 per knot per annum—allowing for interruptions, the maximum earnings in one year were £64,000, or £48 per knot. The Persian Gulf cable is said to be earning at the rate of more than £100,000 per annum, or £85 per knot per annum. Neither cable has yet worked under favourable conditions; the former ends in a *cul-de-sac*, and the land-lines connected with the latter are so badly worked as to cause extreme delay and uncertainty. Such cables can be laid for sums varying from £300 to £400 per knot. The receipts on the Submarine Company's lines seem lately to have been at the rate of about £85 per knot of cable, or £26 per knot of insulated wire.

8. *Deep-Sea Cables.*—Cables laid in less than 1,000 fathoms would now hardly be considered as deep-sea cables, but formerly a depth of 300 or 400 fathoms was thought sufficient to entitle a cable to be put in this class, and the old classification has been adhered to in preparing the statistics of shallow-sea cables. A cable to be laid in a deep sea must, of course, be strong, both absolutely and relatively to its weight in water; it must be light, or the great lengths required cannot be conveniently carried; it must not be liable to stretch, and it must coil well and be paid out easily. At first, light specimens of the form already described as used for shallow seas were generally employed. The Red Sea cable is a fair sample. The first Atlantic cable is very similar, but the simple outer wires were replaced by strands of still smaller wires. The examination of Table IV. will show how far these cables met the above requirements. They could support from 4,000 fathoms to 5,000 fathoms of themselves hanging vertically from the ship. They could be laid, and about 7,000 miles of this class were laid, in depths approaching or exceeding 2,000 fathoms, and these cables have even, for a few miles, been hauled back from these depths. They seldom broke while being laid, but they were not permanently successful. Communication generally ended within a year from the time it was established, and the outer covering was then too much rusted to allow of repairs. The causes of failure were many,—bad gutta-percha joints, bad copper joints, injuries to the insulator before the cable was laid, high battery power burning small faults into big ones and eating away the copper, lightning, from which they were often unprotected. These may be instanced as known causes of failure. It is also said some cables were laid too light, and sprung asunder when the iron wires rusted. It may be conjectured that when these wires rusted the gutta-percha could not bear the cable if suspended across a hollow; these are less probable causes of failure, but it is certain that the rusting of the outside and the failure of the cable generally coincided as to time. The failure was seldom gradual; it was almost, if not always, accompanied by a total fracture or interruption in the copper. When any of these injuries did occur, they were irremediable. The first important modification of the common form was to adopt steel wires instead of iron, reducing their number, and enveloping them in hempen strands, so as to produce a cable which externally looks like a hempen rope. Many excellent experiments were made on this form of cable (which was subsequently chosen for the second Atlantic) by Messrs. Gisborne and Forde, aided by Mr. Siemens. These experiments are given in full in Appendix 10 to the "Report of the Joint Committee on the construction of Submarine Cables," published by government in 1861. The great strength, both absolute and relative, of this form may be seen from Table IV., showing that these hemp and steel cables will support 11,000 fathoms of themselves hanging vertically in water. The mass of steel required to cover the core is diminished by the use of hemp, but as hemp is no lighter than water, it does not buoy up the wire. A steel wire simply wrapped up in hemp weighs much the same in water as a bare wire, and therefore wires, whether simply wrapped in hemp or bare, will support equal lengths of themselves in water, but the hemp may be so applied as to add all its strength to that of the steel, although the extensibility of the two materials is different. To do this the hemp must be spun round the steel with a definite lay, to be ascertained in each case by experiment. Table VI. shows the

TABLE VI.

Compiled from App. 10 to the Report of the Joint Committee on Submarine Cables (Gisborne, Forde, and Siemens).

MATERIALS.	BREAKING STRAIN IN CWTS.			ELONGATION IN PER-CENTAGE OF LENGTH.			
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	No. of Experiments.
Steel wire 0·079 in. diameter	8·50	8·00	8·20	1·80	1·00	1·41	5
Iron wire 0·079 in. diameter	4·50	4·18	4·35	0·72	0·46	·55	7
Steel wire with 4 strands of Manilla hemp ...... ¾ in. lay	9·25	9·25	9·25	1·77	1·77	1·77	3
1¼ in. lay	13·00	12·12	12·59	3·12	2·32	2·63	6
Steel wire with 4 strands of Russian hemp ...... ¾ in. lay	10·0	9·50	9·70	2·18	1·80	1·76	3
1¼ in. lay	11·75	10·87	11·42	2·70	2·28	2·45	5
Iron wire with 4 strands of Manilla hemp ...... ¾ in. lay	4·75	4·50	4·62	0·79	·47	0·63	3
1¼ in. lay	8·50	8·12	8·28	2·80	2·56	2·62	4
Iron wire with 4 strands of Russian hemp ...... ¾ in. lay	5·00	4·75	4·87	0·92	0·66	0·82	3
1¼ in. lay	7·43	5·00	6·2	2·46	1·04	1·82	6
Manilla hemp weighing 0·05 lbs. to 0·0615 lbs. per fathom	3·87	3·62	3·75	..	..	2·62	2
Russian hemp weighing 0·41 lbs. to 0·45 lbs. per fathom	3·50	2·25	2·87	1·60	1·00	1·30	2

strength of iron and steel strands wrapped with Russian and Manilla hemp, and with $\frac{3}{4}$-lay and $1\frac{1}{4}$-lay respectively; also the strength and stretch of the separate materials. It will at once be seen that a difference of lay produces an extraordinary augmentation in the breaking strain and in the elongation. The stretch of a wire when approaching its breaking strain is concentrated nearly at one point, where it rapidly diminishes in diameter. The effect of the hemp is to support the wire at a number of successive weak spots of this kind, and thus greatly to augment the elongation before breaking; but it will further be observed that the breaking strain of the combined materials is actually greater in some cases than the sum of the strengths of the separate materials. Thus the sum of the manilla and steel, taking the mean strength, is a little less than 12 cwt.; but the mean of the combined strand is more than $12\frac{1}{2}$ cwt. With Russian hemp the sum of the separate strengths is 11·07 cwt., but the combined strand supported 11·42 cwt. The results with iron do not show this anomaly, but the apparent paradox with steel wire has been fully confirmed by independent experiments made for the Atlantic Telegraph Company. The explanation is, that when tested separately we have the strength of the weakest points, or smallest sections of the wires and strands; but these materials are never uniform, and when combined, as it is most improbable that the two weakest points should coincide, we obtain the sum of their mean sections or strengths. The cables formed by these hemp-covered steel wires, are very strong. Table IV. shows that the Atlantic cable, relatively and absolutely, is the strongest cable yet made, bearing more than twice as great a length of itself as the old iron cable. The new form stretches more than the old. The hemp may be eaten off, or decay from the wires, weakening the cable, and the hemp affords less mechanical protection against injury; but the stretch is never such as to endanger the core, as has been proved by repeated experiments, and the most serious defect of the cable is probably its expense.

9. *Proposed forms of Deep Sea Cables.*—Rowett's hempen rope could certainly be laid. The lecturer has had no sample of it, but fears it would be extensible. Allan's cable could also be easily laid, so far as its strength is concerned. It is said to coil badly; but the lecturer has not seen this tested. The proximity of the copper and steel inside the cable might cause the steel to rust and burst the core. Still it is desirable that this form should be practically tested. Mr. Siemens' cable, also mentioned in table IV., will be found described in the appendix to this lecture. The stretched hemp has great strength and elongates little, but has to carry an immense load of copper, which does not add to the strength of the cable. The phosphorized copper sheathing would probably be very permanent. This cable has actually been laid and is now working. A trial of it was not successful in deep water, but a piece was recovered from 1,600 fathoms. Duncan's cable, covered with plaited ratan, is too extensible, and the ratan, though durable in water, does not add much tensile strength. The lecturer has had a sample of cable made, in which he used Siemens' stretched hemp, covered with Duncan's plaited cane. Its properties are given in table IV., and its specification in the appendix. This cable combines great strength, small elongation, lightness, and cheapness. A bare gutta-percha core could be laid easily, but could not be recovered from great depths.

10. *Statistics of Deep-Sea Cables.*—Excluding the 1,000 miles in abeyance under the Atlantic, and the cable lost in the first experimental trips in the Atlantic, only some 500 or 600 miles of cable have been lost during laying. About 9,000 miles have been laid and worked a little while but are no longer working. From 700 to 850 miles are now at work, but much of this is in no great depth. The Barcelona Mahon cable, believed still to work, although faulty, is included in this list. There is but one quite sound cable lying at work in more than 1,000 fathoms, viz., that between Sardinia and Sicily, 243 miles long. One section of the Malta-Alexandria cable is in 420 fathoms, and has never shown any deterioration. The probable causes of failure have already been enumerated.

11. The general conclusions to be drawn from the statistics given in this lecture seem to be, that in shallow seas, by laying heavy strong cables we can ensure, and have obtained, success, both from an engineering and commercial point of view; that in deep seas we have hitherto failed, but that success is not unattainable, and may probably be reached by various methods. The lecturer believes that while in shallow seas, where repairs are possible, cables can hardly be laid too heavy or at too great an expense, in deep seas, where repairs will always be precarious, they can hardly be laid too light or too cheap.

Appendix I.—Specification of Cables in Tables.

1. First Atlantic:—Core (*vide* Table III. last *Journal*, p. 176), covered with 18 strands of 7 bright best charcoal wires 0·028 in. diameter, called No. 22. Total diameter 0·62 in.; weight of iron, 15·64 cwt. per knot.

2. Red Sea:—Core (*vide* Table III.), covered with 18 bright iron wires (? charcoal), called No. 16, B.W.G., diameter, 0·077. Total diameter, 0·56 in.; weight of iron, 16 cwt. per knot.

3. Malta-Alexandria:—Core (*Vide* Table III.) covered with 18 bright charcoal iron wires, each 0·12 in. diameter, called No. 11 (?). Whole cable, 0·85 in. diameter; Weight of iron, 33·56 per knot.

4. Persian Gulf:—Core (*vide* Table III.), covered with 12 galvanized iron wires, 0·18 in. diameter, called No. $7\frac{1}{2}$ (?); diameter of iron cable, 0·9 in.; covered with hemp and bituminous compound to 1·25 in. diameter; weight per knot of completed cable, 3·7 tons.

5. England-Holland main cable:—10 black wires, 0·375 diameter, called No. 00; external diameter 1·58 inch; weight per knot, 10·4 tons; shore end 15 wires, 0·22, called No. 5, covered with 12 strands made of 3 wires of same diameter, covered with Bright and Clark's Composition to $2\frac{1}{2}$ inches in diameter; diameter of iron, 2 inches and weight per knot, 19·6 tons.

6. Toulon-Algiers:—Core (*vide* Table III.) covered with 10 steel wires, each enveloped in four strands of Russian hemp; diameter of steel wires, 0·08, called No. 14; diameter of strands about 0·2 in.; weight of hemp in strands (?); diameter of completed cable, 0·8 inch; weight in air, 1·31 tons.

6. Steel and hemp coated Gibraltar (proposed):—Core like Malta-Alexandria, covered with 12 steel wires in 4 hemp strands. Diameter of wires, 0·08; weight of steel per knot, 10·55 cwt.; of hemp 6 cwt.; lay of hempen strands, $1\frac{1}{4}$ inch; diameter of completed cable, 0·875.

7. Iron and hemp-coated Gibraltar (experimental):—Like No. 6, with iron instead of steel.

8. Second Atlantic Cable:—Core, (*vide* Table III.,) covered with 10 bright steel wires each in 5 Manilla hemp strands; diameter of each wire, 0·095 inches, called No. 13; diameter of strand, about 0·28 inches; weight of hemp strands per knot, about 12·8 cwt.; lay of hemp strands, 3 inches. Webster and Horsfall's homogeneous steel; diameter of completed cable, 1·125; weight of steel per knot, about 13·75 cwt., and the serving round core about 2·2 cwt.

9. Siemens' copper covered cable:—Sample in Table V. Copper conductor, 550 lbs. per knot; insulator, 420; diameter of core, 0·52 in. Stretched hempen strands, 440 lbs. per knot; copper armour, 675 lbs. per knot; diameter of completed cable, 0·75 in.

10. Allan's cable:—Sample in Table V. Solid copper conductor, 0·114 in., weighing 240 lbs. per knot; surrounded by 19 steel wires, 0·02 in. diameter weighing 120 lbs. per knot; diameter of steel strand, 0·16 in.; covered with 300 lbs. of gutta-percha, diameter 0·456, and canvas web; total diameter, 0·522.

11. Ratan and stretched hemp (sample in Table V.):—

Core, 3·63 cwt. per knot; diameter, 0·34 in.; covered with fifteen hempen strands, weighing 1·84 cwt. per knot; and covered with plaited ratan cane, weighing 1·84 cwt.; total diameter, 0·625 in.

Tenth Ordinary Meeting.

Wednesday, February 7th, 1866; John Hawkshaw, Esq., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Beales, R., Congleton.
Davis, James, 2, Harley-road, West Brompton, S.W.
Farnham, Edward, Lordship-road, Stoke Newington, N.
Gale, James, 5, College-terrace, Belsize-park, N.W.
Marsh, John, West-bar, Leeds.
Milnes, Thomas, Zetland-lodge, Southport.
North, Charles Augustus, 1, Earl's-court-road, Kensington, W.
Sefton, Earl of, 53, Grosvenor-place, S.W., and Croxteth-park, Liverpool.
Spong, Rev. James, Mortimer-house, De Beauvoir Town, N.W.
Swindells, George, Bollington, Macclesfield.
Taylor, James, 209, Sloane-street, S.W.
Tanqueray, William Henry, Vine-street, Bloomsbury, W.C.
Torrens, Captain Alfred, Junior United Service Club, S.W.
Wace, John Richard, 45, Baker-street, W.
Ward, Lieut.-Colonel Francis Beckford, Guessens, Welwyn, Herts.

The following candidates were balloted for, and duly elected members of the Society:—

Barry, Francis Tress, The Clock House, Beckenham.
Bird, Robert, Crewkerne, Somerset.
Brown, D. J., 34, Great George-street, S.W.
Coley, Henry, Foxdale Mines, Isle of Man.
Crossley, Lewis J., Dean Clough Mills, Halifax.
Davis, Edward Francis, Tavistock House, Tavistock-square, W.C.
Fox, Chas. Douglas, 8, New-street, Spring-gardens, S.W.
Frere, Augustus, 22, Henrietta-street, W.C.
Lewis, John, Kidderminster.
Mackenzie, Wm., 12, Westbourne-square, Bayswater, W.
Mason, Rev. Joseph, Loughborough, Leicestershire.
McCormick, Wm., 22, Cambridge-terrace, Hyde-park, W.
Medhurst, Thomas, 465, New Oxford-street, W.C.
Merton, Louis, Junior Carlton Club, S.W.
Monkhouse, Rev. John, M.A., Church Oakley, Basingstoke.
Newman, Stephen John, 4, Church-terrace, Lady Well, near Lewisham, S.E.
Nixon, John, Cardiff.
North, George, 22, Whitehall-place, S.W.
Pelly. Charles Raymond, 129, Park-st., Grosvenor-sq., W.
Smith, George, L.L.D., Trevu, Camborne, Cornwall.
Spence, Joseph, Holdgate-hill, York.
Stevenson, John, Baxter-gate, Whitby.
Stonehouse, Wm., Abbey-terrace, West Cliff, Whitby.
Trickett, Henry, 67*a*, Hatfield-street, S.
Worthington, Richard, 27, Mincing-lane, E.C.
Yeates, Horatio, 221, Regent-street, W.

The adjourned discussion on the paper read by Mr. William Hawes, on the 29th November, 1865, "On the Proposal that the Railways should be Purchased by the Government," was resumed by

Mr. Edwin Chadwick, C.B., who read the following paper, prepared at the request of the meeting just referred to:—There is much in the important subject before us that powerfully affects various arts which the Society promotes, but the question has been brought forward in the manner more common on political platforms than in scientific assemblies, chiefly by large dogmatic assertions, the answer to one of which involves the exposition of a system. Thus the chief position taken by Mr. Hawes amounts to an assertion of the utter and inherent unfitness of any Government to manage railways, or postal communication, or anything else, so well as is done by private railway companies. The pretensions put forward by himself and other directors of railways go to this—that the formation, maintainance in efficiency, and security of the main lines of internal communication of the nation, are no longer to be of the proper duties and functions of the chief executive or the head of the state; that they are no longer to be, as of old, public highways, the King's highways, or the Queen's highways, but are to be private company's highways, to be private premises, from which the public peace officers may be excluded, and from which every subject is excluded, unless, before he enters them, he stand and deliver whatsoever is exacted from him, not as a payment for a service, but as an exaction of a profit, on his presumed necessities of travelling. The answer to the implied assertions in relation to the primary duties of a Government would be in chapters or volumes of text books, expository of the theory and practice of the proper elementary functions of a well organised state, to one volume of which, as the most profound exposition of principle, I would refer those who would satisfy themselves on the point, namely, the "Constitutional Code for all Nations," by Bentham, in which it will be found that of the several chief ministers, including the Health Minister and the Education minister, whose duties are to be extended, is that of the Interior Communication Minister—the head of a high and comprehensive department of the state, appointed under tests for aptitude, and charged with duties, and subject to real and stringent responsibilities, for maintaining with safety (with the economy, as well as the efficiency, derivable from unity of management), the whole of the interior communications of the country. The pretensions put forward by the private enterprisers in the new method of communication imply further that, whilst the mechanical arts and the experimental sciences are progressive, there is no science or art in legislation or in administration, and can be none equal to those of the commercial companies—that the arts of public legislation and administration are stationary or retrograde, and incapable of any adaptation to changes of circumstance or mechanical or economical progress. If the notion of public administration of Mr. Hawes, and those whom he represents, be that the only possible Government management in this country applicable to the new subject matter in question of railway communication is that of an old department and a decayed system, solely under the so-called responsibility of a changing party political chief, of no more special aptitudes or training for the subject than any retail dealer experienced only in transactions of pence, or perhaps of hundreds of pounds, and the direction of a household or of a shop, usually has for the immediate administration of millions, and discipline of thousands of men as a railway director —if their conception of Government executive management be solely of such a changing political chief who may have to leave the service by the time he had learned it, and whose days and nights are given to a multitude of other and disparate subjects—whose chief concern is less for the success of the branch of administration, than for the success of his political party—if this be the notion derived from too much of our Government as it is, it is a notion that may be corrected by a reference to the great thinker I have cited, and a study of our Government as it may and ought to be. But be the defects of our public administration what they may—and with other public officers, as administrative reformers, I may claim to have pointed out defects and promoted reforms which outside reformers have failed to see—whilst the pretensions of railway directors to freedom from the

like defects, implied in the claim to have the public functions set aside in favour of the railway administrators—the realities in respect to them are thus stated from close observations by Captain Galton, of the Royal Engineers, who had been long engaged in the examination of railway accidents, and the performance of other duties connected with these companies:—"This vast property is often managed by directors who only meet occasionally, who only give up a portion of their time and thoughts to the concern, and who frequently absorb the time and fetter the responsibility of the manager appointed under them. On one railway, which extends over nearly 1,000 miles, there are thirty-two directors, not one of whom is paid at present sufficient to demand his whole time and thoughts. A private concern could not go on under such arrangements. Besides, those who are officially charged with the duty of looking after the safety of the traffic, do not occupy, as a rule, such a position or status in the company as the importance of their charge calls for; nor is there generally that gradation of responsibility which alone enables the directors to hold their officers responsible for results." Out of 405 cases of so-called "accidents" inquired into by engineer officers of the Board of Trade, only 43, or one out of ten, were reported upon as having arisen apparently from causes beyond control. The great majority were proved to have arisen, not even from the neglect of inferior officers, but from the insufficient regulations, or the want of discipline, or the misplaced parsimony of the directors and superior officers; whose administration is proved, in repeated inquiries, to be at once wasteful and parsimonious from ignorance and incompetence. The late Sir Robert Peel, whose course on railway legislation has been admitted by impartial authorities to have been a deplorable mistake, which has subjected the freedom of trade to the clog of many more millions of extra charges on intercommunication than were imposed by the protective duties on the import of corn, justified himself by declaring his want of confidence in the "torpid hands of government." To whom, however, but to himself, and other party leaders in the like position, was the continuance of this torpidity due, from their neglect to animate the executive hands of government, the permanent officers, with a proper interest in improvement! To the army and the navy the stimulus of prize money is provided as necessary for successful enterprise. Let that stimulus be regularly and specially provided for the civil service, and it will soon be in the van of progress. Yet it will be found that whilst there is this acknowledged defect in our old govermental departments, the private railway management, with a subject-matter more obviously in a state of progress, more urgently in need of improvements in detail—is even more grossly in default in administrative organization in this respect. I might fill whole papers from the expositions of engineers, in the discussions at the Institute of Engineers on railway accidents, with examples, not of speculative, but of tried and proved improvements in methods of administration neglected, and of tried and proved mechanical inventions for security and economy unapplied by the private railway administrators. I may cite such concurrent testimony as the following as to the cause of railway mal-administration, given by Mr. Bridges Adams, who has had experience of the difficulty of obtaining the adoption of tried and proved improvements. In his work on roads and railways, he observes:—"It may seem strange that improvements are not made, but there is little surprising in it. Boards of directors put all the responsibility on their officers, who are by no means overpaid, of making improvements requiring great care in experimenting; and innovations are rarely made in any branch of art by those engaged in the daily pursuit. It is the bystander who looks on and sees defects and invents or contrives remedies which he brings before boards. If the engineer of the line wishes for a quiet life he will content himself with things as they are, and being no worse than his neighbours. If he adopts any improvement and it turns out a failure, a want of judgment will be attributed to him; if it be a success the inventor gets all the repute from those who cannot reflect that good judgment is as important a quality as good invention, the recogniser as essential to progress as the discoverer. Experiments are denounced as a source of expense, yet it is quite certain that the want of experiments is the foundation of waste."—Pp. 177-8. I must stay, however, to notice the common assumption that slowness to entertain new ideas or to adopt improvement is a habit of our Government solely. Admitting it to belong to such Government as is conceived by the objectors, (such Government, too, as the private and sinister interests tend to produce), I must yet deny that such apathy is peculiar to it. Lord Russell has said that, as a rule, it takes a quarter of a century to get the minds of the British people saturated with a new idea or principle. Look at the struggle of the steam engine during some half a century before it was got into national use. Look at the history of other inventions, and the lives of eminent inventors; why it is a martyrology of long and wearisome delays, of piracies committed upon the labour of inventors, of public loss and individual ruin and misery, arising from the impassibility, the ignorance, or the want of principle, of the common, private, commercial, or manufacturing mind, even to new gains to themselves, individually. Why, in relation to the subject matter, the railway itself was patented in 1733, and there is a yet later example of a railway from Merstham to Wandsworth, passing through Croydon, which was begun as early as 1801 and opened in 1803, when its capabilities were tested by the commercial men and the men of science, who saw that one horse could draw some sixty-five tons at a rate of six miles an hour, and who, nevertheless, declared that railways could never be worked profitably. I knew, personally, Thomas Gray, who first planned a system of general iron railways in 1822, and who endeavoured to rouse the attention of the Corporation of the City of London, with as little effect as the then Prime Minister. I knew, personally, parties concerned in the project for the railway from Liverpool to Manchester, and was told that they took the idea from him, for the purpose of carrying goods; and it appears clearly that but for the accident of a quarrel with the Bridgewater Canal Company, on account of their excessive monopolist exactions, railway communication might even now be in the first stage of its existence. Thomas Gray, whose general system of direct public lines has since been declared to have been sound, died, after a life of conflict, in poverty and neglect, whilst monuments were raised to men who made large fortunes on the basis established by his labours. The apathy which may exist in men of superior position, as to improvements in works or in administration which benefit the public at large, will be found to be often only a faint reflex of that which exists below in relation even to improvements directly benefiting themselves. The low state of administrative ability, prevalent in the private companies, is displayed by the sort of accounts they issue, without logic, without test-points to display progress and to show real conditions, which usually can only be got at by laborious investigation when any question arises. It is singular that in this country, with the largest amount of business, the art of account-keeping should be at the lowest, as displayed by the vast amount of bankruptcy, largely due to ignorance and neglect of duty in account-keeping, against which the French Code de Commerce provides. Mr. Hawes, indeed, who has rendered high public service by his long-continued exertions against the evils of bankruptcy and insolvency, states, in a recent paper on the subject, that the total losses by these evils were proved to have amounted, in 1846, to no less than forty-nine millions of money for that one year. The returns by which it was proved were collected from all parts of the country, and received the most rigid scrutiny, and he said they could be only impugned on the ground of insufficiency. He

only states that this rate of annual loss, approaching to double the interest of the national debt, and exceeding the annual charges of the army and the navy, and all the civil service of the empire, has not since then been increased. Such as it is, I present it him as a study of the superior pretensions of the private enterprisers, as a class, to moral and intellectual superiority, as against governmental administrators, as a class—for the management of such public works as those in question. That the lax habits prevalent in private trade enter, to a dangerous extent, in railway administration, is proved by repeated explosions in large companies, and by the extent of continued occupation of the Courts of Chancery with railway suits. The late Sir John Easthope, who was experienced as a director and in business matters, in French, as well as in English railway companies, told me that he considered that rogues in disposition were as abundant in France as in England; but he attributed the far less amount of defaulting in the French companies to the protection given to property by the far better account-keeping there, which is derived from the French Government, whose accounts, military as well as civil, all English administrators who have consulted them consider to be greatly in advance of any public or private commercial accounts kept in England. A system may, however, be correctly judged of by its outcome. The general promise to original shareholders, by private enterprisers as railway directors, has been 10 per cent. The actual traffic has generally been vastly beyond all previous estimates, yet the return has averaged little more than 3 per cent. to the original shareholders. They would consequently have benefited if they had kept their money in the public funds. Any government which had presented such a failure, such a contrast of performance with promise as has been done by the majority of the railway directors, must have been irretrievably driven from power, amidst general indignation. Whilst such has been the outcome of the management of the boards to the shareholders, the outcome in servants, officers, and leading private enterprisers in public functions, is in frequent princely fortunes, displayed in estates, like those of peers, bespread over the country. Amongst railway directors are no doubt men of first-rate ability and character, and I attribute a great amount of failures to the defective administrative principles on which they act; to incidental and divided attention and responsibility, in place of the constant undivided attention which is needed for the successful management of great concerns. Many of the same men, who give attendance once or twice a week at boards or at committees, would produce results proportioned to their labour, if they were called upon to give all their days and nights to the same subject matters of administration. I myself have tried such posts in concerns in which I took an interest; but, finding that to do justice to them they required constant and undivided attention, I have withdrawn from them, finding indeed that I could, in the like position, only do as others did, and probably, at my best, not so well. Any examination of these defects in the administration of directorates is, however, met by allegations of the defects of the public administration sometimes too true on particular points, and by loud dogmatic assertions of the utter incapacity of the government for the management of the railways. But on this subject we must not allow our observation to be confined, as is our wont, to the experience of this country. Mr. Hawes, in advancing the position that our government, as it exists, is incapable of the responsible exercise of the proper functions of a good government—the maintenance of the freedom, security, and efficiency of internal communication,—that it is incapable of doing what is done by the constitutional government of Belgium, by the constitutional government of Wurtemburg, or by the Swiss Republic, not to speak of what is done by the governments of France, Austria, and Germany, would, if he succeeded, establish the conclusion that ours is a government which, as an obstacle to the most important progress and freedom of trade, it behoves us to change. For myself, however, I must repudiate his conception of any intention of such direct government management, under existing conditions, as he supposes. When discussing the subject with public officers as a legislative and administrative question, about the time of the completion of the first main lines, some of them will bear me witness that the course I then proposed was that the Government, on inquiry and proper local consultation, such as was given by Captain Drummond and Colonel, now General, Sir John Burgoyne, in their report as commissioners for railways in Ireland, should mark out the main lines of communication, raise money on the public security, and let out those lines to be farmed, and lease them to be worked on contract by the best bidders, as was afterwards done in France and Belgium, where, be it known, the cost of construction, as stated in official returns, was £16,000 per mile, in France £25,000 per mile, against £39,000 per mile in England—with railway fares, for the like quality of carriages, nearly one-third less to the public; with dividends in Belgium of about 5½ per cent., and in France nearly 7 per cent., as against little more than 3 per cent. to original shareholders in England. Now, one president of the Institute of Civil Engineers—the late Mr. Robert Stephenson, who, it will not be denied, was a man of the widest practical experience in railway matters, abroad as well as at home—in one of his latest public speeches, at a great reception given him in Canada, solemnly warned the Canadians to avoid the example of England, and advised them to look to the examples of Belgium, of Switzerland, and of France. Another president of the same Institute, who had been engaged in the construction of railways in France as well as in England, the late Mr. Joseph Locke, in his inaugural address, declared that the Government of France, "whilst strongly controlling, has also liberally fostered this kind of enterprise, while the English Government, on the contrary, unable to guide, suffered, if not encouraged, hostile or selfish interests to encumber or pervert it." The French legislature had, he said, "reconciled the two important interests of the promoters and of the state with considerable success; so that while substantial benefits have been secured to the latter, the former have been enabled to derive a liberal return for their outlay." A third president of the Institute of Engineers, Mr. Bidder, declared, in a discussion on the economy of railways, "that the conclusion at which he had arrived was that the railway system would never prosper until all the lines were worked by contract, and the unseemly quarrels of directors, secretaries, and managers no longer interfered with their success." Professor Pole and Mr. Jeaffreson, the biographers of Mr. Stephenson, state as his conclusion, in concurrence with others, "that the best authorities on railway interests, and the term includes the interests of the public as well as of the shareholders, are unanimous in avowing the inefficiency of railway management by directorates elected from the shareholders." The biographers recite, as Mr. Stephenson's opinion, that the best plan would be to let the railways to farmers, like the farmers of turnpike roads and bridges, who should pay a certain fixed or variable "rent to the shareholders, and retain the surplus rents, that by such a plan the shareholders would be secure of their dividends, and the public of good accommodation. The only individuals who would suffer by the reform are the gentlemen who at present play with money which is not their own." A fourth president of the institute of Civil Engineers, Mr. M'Clean, I believe, did present the example of the successful working of the railways by farming, together with a brilliant example of the increased return obtained by low fares. Here, then, as against the opinion and testimony, a very high one, I admit, of Mr. Hawkshaw for the present system, we have preponderant testimony which I have cited; and not only so, but I have a letter from the late chairman of the Lancashire

and Yorkshire line of railway, where Mr. Hawkshaw began his distinguished career, in which the chairman, the late Mr. William Stuart, declares that on this subject France was decidedly in advance of us. In justification of the principle of contract management by the Government, I may cite the fact as of general experience that the postal system of the country was one entirely of Governmental direction, by the contract service of the mail coaches, and that it was so superior to any private enterprise, in security and punctuality, that it was proverbial, that when any one would be certain of arriving at his destination, he would go by the royal mail. The mail packet service, more especially the North British Mail Packet, and the Peninsular and Oriental Packet Service, under Governmental regulations, is, in itself, a greater marvel of the safety of transport, as well as security, than, I believe, will be found under any unregulated private enterprise in transport in the world. That the mails should be conveyed in the Cunard line at the high rates of speed they have been, at night, through the fogs, and the icebergs, and the fishing vessels of Newfoundland, without the loss of a single passenger during twenty-five years; that the Peninsular and Oriental Packet Service should have two hundred and eighty thousand passengers without losing one until recently, when sixteen were lost in a vessel overwhelmed by a cyclone, is a fact in administration as well as in nautical science, which may be claimed as an honour to our time. If, however, the like vessels were provided, officers of the Royal Navy are to be found who would, under a suitable administration, carry out the like regulations directly in behalf of the public. In the latter part of the transport service of convicts to the Australian colonies, under governmental regulations, the health of the convicts during the voyage, as I have elsewhere shown, far exceeded the health of the like classes and ages living on shore under local self-governments of any kind. Public opinion will require governmental regulations to give to passengers, as also to the crews, of vessels under private enterprise, the like security to life, and the exemption from disease, which are obtained in the Royal Navy, where the losses of vessels in service, are now seven times less, and the death and sickness rates two-thirds less than in the scurvy-ravaged ships of private enterprisers of the mercantile marine. In respect to railway conveyance, however, the least irregular are notoriously the night mails, and the distinction is due, as in the case of the mail coaches, to the Governmental regulations, and to such imperfect supervision and correction as the jealousy of the railway directors in parliament permits, but for whom it would be more punctual, more safe and convenient, as well as more regular. The pretensions of railway directions to credit for aiding the new postal system, as well as for competency in their administration, were in great measure disposed of in our report on a parcel postage, printed in the *Journal* of the Society in July, 1858, a great improvement for the retail trade of the country, which is yet obstructed by the false commercial principles on which they were proved to proceed to the injury of their shareholders. I must say that it appears to be a surprising delusion in which a claim is set up on behalf of the railway directorates of serving the post, by an average exaction of 4s. 10d. per mile for the conveyance of mails by railways, as against an average of 2s., for which the service is rendered by mail coaches,—that is to say, as was proved, the monopolist exacts from the public for the use of only a fraction of a train a sum exceeding by 200 per cent. the whole cost of running entire trains. The state of knowledge pervading railway directorates in claiming credit for the success of the penny post is displayed by the fact, that really the highest success of that great measure was, in the old twopenny post or metropolitan district, with which the railways have had nothing to do, and where the increase of the letters, from one part to another of that district has been sevenfold, and now, mainly from the element of reduced and uniform rate alone, the correspondence within it, upwards of one hundred and seventy milllions per annum, equals its correspondence with all the rest of the empire put together. The past railway administration has diminished the benefits derivable from the element of increased speed available from railway communication, and now operates as a serious obstruction, to the improvement of the whole postal system as well as to the general inter-communication of the country. It is established by such testimony as that of Mr. Hawkshaw himself that, with direct lines, properly constructed, and freed from goods traffic,—as already made duplicate lines are,—the general speed of railway conveyance might now average, throughout the trunk lines, the regular rate obtained on some parts of them, or sixty miles an hour. Under unity of govermental management, answers might be obtained in extensive districts, and returned, too, within the same day, instead of the second day. It follows, too, from such facts as those which have been established, that, under a reformed railway system, the London purchaser would be enabled, at half the existing fares, to go to Manchester or to Liverpool, see his goods himself, and make his purchases, do a day's business, and return home the same night, dispensing with the expense, the delays, and the uncertainties of much intermediate unnecessary brokerage and agencies. In respect to the accommodation provided for long journeys, who that has travelled in the first-class saloon carriages in Switzerland, which are improvements on what I am told are the superior saloon carriages of America, will not feel indignant at the relatively barbarous construction, the discomforts, and insecurities of the English railways, which make long journeys by rail, and especially by night, painful and disagreeable necessities which would be postponed on that account alone, apart from the exorbitant charges. The merit and practicability of much of the labour of invention of Mr. Bridges Adams are, I believe, acknowledged by practical men, and his statement will not be impugned wherein he says, "The convenience of humanity should be studied as the datum line for the construction of the carriages. They should be lofty enough to permit standing upright, they should be ten feet in width, with a central passage-way to permit the guard to pass from one end of the train to the other, thus getting rid of the difficulty of the want of communication between the guard and the driver. On either side the passage should be enclosed cabins or apartments for four persons each for passengers wishing to be private, and open saloons could be provided for the gregariously disposed. The seats of each passenger should be arranged to fold up against the partition, so that the passenger might sit or stand at pleasure, an important consideration to ensure the free circulation of the blood. Arrangements would be made to provide tea or coffee and similar refreshments whilst travelling, and also for efficient warming, ventilating, and lighting, and, by fitting construction, easy movement, without vibration or oscillation, the traveller would be enabled to read or write at pleasure. In this mode a constant speed of from fifty to sixty miles per hour could be sustained without obliging the traveller to alight or injuring his health by the vibration of the brain or nerves, or the digestive organs by swallowing food in too great a hurry or at too distant intervals of time." Conceive the difference in the amount of inter-communication by families obtainable at long distances by railway reform in these respects, and the certainty of improved returns derivable from reduced fares for proper accommodation! It is a dogma of mine that the fact of a thing being done is cogent evidence of its possibility. The reform projected in respect to conveyance would, I am assured, be the adoption of a reform realised under a governmental management, which private enterprisers on public necessities in England hold cheap. I cite the following description from the *Nord* of the railroad

carriage now running on the Moscow and St. Petersburg line:—"It appears that for the trifling addition of two roubles (about 6s.), to the usual fare travellers are received in brilliantly lighted saloons, around which luxurious sofas and arm-chairs invite the weary to repose, while perusing the latest periodicals, newspapers, or novels which are scattered on the tables. When the hour of retiring arrives the *valet de chambre* conducts the gentlemen passengers to their sleeping apartments, while smart chamber-maids point out to the lady travellers their bedrooms and boudoirs, fitted up, as the advertisement says, 'with every modern luxury, including baths,' &c. The smoking-rooms have perfect contrivances for ventilation and the thorough enjoyment of the cigar, pipe, or hookah." If I were to confine myself to proofs of the governmental success in contract management as a basis for its intervention in behalf of the public, for the reform of the railway administration, I might appear to admit the objections made by private enterprisers, and loudly reiterated, without answer, until they are believed, that the Government is utterly incapable of any direct management of manufactures, or of anything else of an administrative character;—that it does everything badly, and that the glory and success of the country are in its local self-government, in every form. As the question, raised by Mr. Hawes, is one on the art and science of administration, I must beg leave to say something more on the topic, and to deny the proposition, more particularly as the logical conclusion to which the allegations lead, savours somewhat of sedition. And, first, as to the government works. Some years ago, before there had been any important reform of the dockyard management, a noble friend of mine, then a Lord of the Admiralty, got out the expense of a number of ships built at the government dockyards, as compared with the expense of a number of ships built for the Government, at private yards, by private contractors, and it was proved that, although the contract-built ships were cheaper at the outset, yet when they were tested, after a period of time, they were found to yield no advantage over the Government-built ship. In the Crimean campaign private contract system was a decided failure, and since that time the dockyard management has been improved, by the check given to the political patronage of the borough members, by the competitive examination of the men. In America the Government manufacture is preferred; and in other governments it is proved that, where the quality is important, the private manufacture is the least to be relied on. The attempts made to show that the small arms of equal qualities from private makers in Birmingham have been supplied cheaper, have been, I am assured by competent and impartial investigators, proved to be entire failures, that is to say, as to the comparative cost of working up the raw materials sent in. Mr. Cobden's allegations of the superiority of the private contract system have all broken down. Private enterprisers, Manchester manufacturers—as members of Parliament—have been put on committee after committee, and also on commissions, to suggest improvements in the public administration of service, of ordnance stores, &c., and they have utterly failed in their pretensions;—not that the departments were unsusceptible of improvement, but that it was proved not to be in the capacity of the objectors to make them. The brother of the writer of the paper, the late Sir Benjamin Hawes, told me that he had shown the methods of conducting business at the War-office to men of private business. But they could offer no amendment, and I may claim to have shown them some large public business, by which they admitted they were surpassed. I shall not be understood as defending all Government management. I concede that Mr. Dickens' characteristics are fairly applicable to much of it. I have myself written largely on the need of reforms in the civil service of the country. It suffices to me to cite instances in proof of a governmental capacity for reforming as well as for being reformed. Instead of that local self-government, of which the cymbals of self-laudation are loudly beaten by rate-expenders,—instead of it having anything to teach in public administration, the chief branch of it has been itself taught the very elements of business management by Government officers or superior intervention. In the examination of the administration of some sixteen thousand parishes, amidst the penury, the cruelty, the oppression, with the ignorant waste, confessed and notorious on all hands, it was remarkable how rare were the examples of amendment or of capacity of suggestion of amendment which they presented, and scarcely more than half-a-dozen instances of really able administration could be found, and not above three or four who had conceived any leading principle of an improved adminstration of the parish, one of these being a Captain in the East India Company's service, Mr. (afterwards Sir George) Nicholls; and the other an accomplished clergyman, Mr. Thomas Whately, of Cookham. In large districts the local administrators, even tradesmen and shopkeepers, will have first seen systematised business accounts in the form officially presented to them by government intervention and by governmental officers, by whose labours a saving has been effected of upwards of sixty millions, or two millions per annum; and certainly a better and more beneficent relief administered;—though the improvement, in the application of definite principles, for a more beneficent treatment of the sick, as well as in the training of orphan and destitute children, has been checked midway by the outcry in behalf of local self government and centralisation. The outlay which was charged as an extravagance, for the payment of the Government officers, was about three quarters per cent. on the income superintended, a lower rate than that charged for private professional services. It was about one and three quarters per cent. upon the actual economy effected. In respect to local works, it has been shown by Governmental inquiry and proved by actual work conducted under Government aid and intervention that three houses and three towns may be drained well, or so as to reduce ordinary death rates in crowded districts by one-third, at an expense heretofore incurred by unchecked private enterprises and local government, for draining one ill. Prisons, more especially borough prisons, which were great fever nests, have, under governmental regulations and inspection, been made standards of sanitary improvement, and have an immunity from diseases which scourge honest outsiders. Common lodging houses, under governmental or police supervision, have been drained and cleansed, and preserved from the epidemic visitations which ravage the honest labouring community, whose habitations are under the so-called local self-governments. In the army, the death-rates have been reduced nearly one-half,—with much yet to do,—whilst, despite of precept and demonstration, they are, with lavish expenditure, increasing in the cesspool-tainted districts under "vestralisation" in the metropolis, and under such governments as those of Liverpool and Manchester, and others, where, of all the children born, half are in their graves before their fifth year, chiefly from miasmatic diseases, from which orphan children in district institutions under governmental regulation have an almost entire immunity. In respect to local self government in other respects,—as displayed just now in the almost utter failure of the local police to do what is pronounced to be necessary to check the cattle plague,—it has been shown upon Governmental examination and by normal instances, in conformity with the principles established by inquiry, that but for local ignorance of the principles of public administration, and the existence of sinister interests, the whole country might have had the protection of a general and efficient police for nothing, that is to say, for the money now muddled away by town councils and Watch Committees and parish unpaid constables and Dogberries. Nor is it solely on matters of public though local administration that the general

Government has been in advance in reform. It has carried reform into private manufactories and places which were assumed to be the places where Government interference could only be mischievous. My colleagues of the Commission of Inquiry into the labour of young persons in factories found with myself, that the productive power of these persons besides being worked painfully, was worked wastefully, uneconomically, and uncommercially, as mere stock. The common manufacturing economy was like that of a farmer who raised two colts to obtain one working horse, and that horse by overwork was knocked up in half the period of working ability by premature decrepitude arising from mismanagement. Candid manufacturers, formerly opponents, now admit the sound economy as well as the beneficence of the Government interference, and are advocates for the extension, now going on from trade to trade, of the like interference to check the ignorant and cruel mismanagement of the stock of labour. This brings me to a test point, in my view, of the very core of administration of railways by the common directorates. Mr. James Brunlees, the engineer of the Great Northern Railway, in a paper read at the Institute of Civil Engineers, showed the defective administration of the railway companies, especially as respects the appointment and the management of the great body of men they employ. Intelligence, steadiness, and self-reliance are important qualifications for the economical working of such undertakings, especially where costly and dangerous machinery is to be dealt with. Mr. Brunlees points out that the wages usually given by railway companies are too low to command such qualifications, and, as a consequence, he says, "inferior men are employed, who are incapable of appreciating the importance and necessity of executing their duties with promptitude and exactitude." But this inferior attention is often over-taxed to an extent which would be too great for the attention of men even of a higher grade, and it in itself stamps the character of the common management. He points out the overworking of railway servants as a serious element of danger, principally from the insufficient number employed. "The number of hours," he says, "during which they are kept on duty cannot fail to render them less vigilant. In the course of inquiries it has been found that drivers have, in some cases, been employed for a period of seventeen hours daily, and they have been known to be on duty as much as 26 hours, and even 30 hours, continuously. An insufficient number of servants tends to unpunctuality, to being obliged to make use of unqualified or inexperienced persons for the performance of onerous duties." Capt. Galton, in a paper in which he showed how small is the proportion of railway accidents which are not directly attributable to the mismanagement of the directorates, also points out that where negligence has been one of the contributing causes of accidents, "the negligence has been attributable to the defective arrangements of the company. For instance, in the case of an accident caused some years ago by an engine-driver running past a danger-signal—the engine-driver and the fireman had been out on the engine for thirty-six consecutive hours. Pointsmen and engine-men have, in some cases, been regularly kept on duty for seventeen or eighteen hours out of the twenty-four; and sometimes the rule has been, that for one day in each week a pointsman shall remain on duty for twenty-four hours at a time. Negligence in cases of over-work is not chargeable as a fault against the individual servant, but against the company." Instances of the like sort are of constant occurrence. Now my experience, as a commissioner of inquiry into the labour in factories, warrants me in declaring, that twelve, thirteen, fourteen, or fifteen hours of daily attention, from day to day and from year to year, are requirements against the laws of psychology,—against, indeed, the laws of human physiology; that these violations of natural laws involve insecurity and waste as well as cruelty; that the people who commit them, as these railway directors do throughout the country, prove themselves entirely incompetent to the management of the labour they have in charge, and that they ought, on the score of the labour alone, to be superseded, as decidedly as any commander in the royal navy would be superseded by sentence of a court martial, who, amidst constant dangers, undertook to work his ship by subjecting common seamen to such excessively long watches.—I have now indicated the character of the testimony and of the facts (to which I might add volumes), on which I rely, for the vindication of the governmental capacity, and for the dislodgement of my assailants from the position they have taken up, to justify what is called private enterprise in the public functions. Foreign nations who have followed us in the same course are repenting it. In the United States there are public reclamations for a resumption of the public rights and the state responsibilities in free and cheap communication. At the Social Science Congresses, abroad as well as at home, pretensions like those put forward on the present occasion by railway interests, have been discountenanced, and an extension of the state control insisted upon. I now beg attention to the chief commercial principles comprised in this topic of legislation, by a return to which the great defaults committed may be retrieved. The chief defaults are first, those against unity of management for efficiency as well as economy;—secondly, exactions on necessities, by means of monopolies, instead of payments, merely for service, without profits;—thirdly, charges in disregard of an economical principle of increasing ratios of consumption with diminishing ratios of price by means of monopolies. And first, as to the administrative principle of consolidation and unity of management. Captain Lawes, a very eminent and successful railway manager, estimated the saving derivable from a general amalgamation of all the railways at 25 per cent. That is a topic to be investigated. There are now some hundreds or more of directorates and separate staffs which admit of more or less consideration. But I doubt whether the saving on that head would be considerable, and whatever it might be it would be required for an increase of efficiency by a reduction of the excessively dangerous long daily hours of service, and by augmentations in number and efficiency of the permanent working staff of the railways throughout the country. I imagine that the chief sources of gain to which Captain Lawes must have referred would be those specified by Mr. Braithwaite Poole, an engineer, in a paper read at the Institute of Civil Engineers, in 1856,—on the benefit st obe derived from the amalgamation of the whole of the rolling stock in the kingdom, uniformity of manufacture, economy in the use of stock, running trains alternately on parallel lines, or wherever practicable upon one of the two lines only, or, as he points out, "if upon parallel lines, the trains were to run alternately, or wherever practicable upon one of the two lines only, thereby giving better accommodation to the public, increasing the traffic, and diminishing the working expenses." But the gain of time to the public, and accommodation to traffic—and thence on its development to the shareholders—would certainly be considerable. In cross traffic it has been alleged, and I believe it may be proved, that the saving of time by the avoidance of the obstructions from unnecessary changes of carriages and stations, the non-adjustment, often wilful, of the trains of one line to those of another, maintained from mere spite from year to year to the disadvantage of the shareholders as well as of the public, would amount to one-third without any augmentation of the present irregular and often slow rates of speed, as described in the excellent evidence of Mr. Bidder, which I have just seen given before the railway commissioners, who says that two waggons might be made to do the work of three, for if the railways "were worked by individuals, lessees under government, working for their own benefit, it is

well known that they would be worked more advantageously than when railways are worked by boards of directors." "I am certain," he says, "that if the whole of the Irish railways were under one management, traffic would grow up through the country that nobody has any notion at all of." And Mr. Allport, the general manager of the Midland Railway Company, is constrained to admit his failure to obtain by agreement the large benefits derivable from unity. Amalgamations would seem to be favourable to the public interests as well as the interests of shareholders. But from want of capacity for administration, I am assured that those made by the railway directorates are generally illusory in that respect;—that, for the most part, they are merely aggregations of one crudely formed management to another, with continued independent and clashing action, with little or no economy from the more systematised labour and action, derivable from management on a large scale. An experienced railway officer assures me that he can prove that on the London and North-Western alone, by a real amalgamation of lines purchased at enormous cost, from one to one and a half per cent. might be added to the shareholders' dividends. My conclusion in this respect is founded on the declarations of permanent railway officers of their disgust at the incapacity of their directorates. Another source of loss to the public from this disjointed management is one very considerable in every detail of daily business as well as of travelling, which arises from want of uniformity of rates and charges as well as of times. An eminent manufacturer of paper in Lancashire, Mr. Wrigley, tells me that an offer of rags at Plymouth, or elsewhere, frequently turns on the cost of carriage. He can only get immediate information from the railway which passes by his manufactory. The station-master there can only tell him of their own charges, and must write and inquire to ascertain what the charge will be for that particular commodity at other and distant places. It is sometimes as long as a fortnight before he can learn, there being no law or principle which governs those charges. In our report on the subject of a small parcels post, we showed that a parcel to be conveyed from Land's-end to Thurso went by nineteen different modes of conveyance, of which ten were by different railways,—that from Thurso to Valentia in Ireland it must have nineteen different changes of carriers, and fifteen from Land's-end to Valentia, of which the greater part were different railway companies. In travelling, the study of Bradshaw at every journey, and the labour and difficulty of adjustment, occasions a loss of time and worry of money value. Sir Rowland Hill's principle of the uniformity of the penny post, as far as it could be carried—in saving the labour and trouble of adjustment to the public, and of taxation to the officers of the post—was itself an improvement equivalent to a labour saving improvement in mechanics. Such improvement the present management of the railway proves itself clearly incapable of. It has not been able to get uniformity of signals, so important to the safety of property as well as of life. A man who has served on one line has new and most unnecessary changes of system to learn on another. In the railways under the Government control, and with unity of management, the experience gained in one part is freely imparted and collected for the whole, in mechanical as well as administrative improvements. Hence there is a great advance made in the economy as well as safety of construction, beyond ours, in the German States especially. The railways of the country are now much what the postal system would have been if it had been under some hundred separate and independent private joint stock enterprises, conducted as the postage itself was indeed of old, on the railway directors principle, that no one wrote except when he was obliged, and might have exacted from him a charge paid as for a necessity. If a Rowland Hill were to have arisen, under such conditions, with new and available administrative principles, his ability would have been lost in one district. If a railway Rowland Hill were to arise for the reform of railway administration, the first step to make prevalent his principles would be to abrogate the separate managements, and to make clear the ground of obstructions by an entire resumption of the public rights and duties under unity of management. The abandonment of the chief great public highways, as private premises, deprives the public of the protective services of their own responsible police upon them, and obstructs the proper action of that force, at the most important point, or compels an augmented expenditure for other and separate means. It is true that authority is reserved for the public use of railways in the event of war. But the disunity of management impedes the construction of lines, which would be economical for defensive purposes, and in the event of war, the disjointed machine available is of far inferior efficiency and value to what it might have been made without detriment to the ordinary traffic of the country. Disunity, disjointed organization impedes administrative consolidation and prevents the economy which is obtainable by the distribution of rents and establishment charges, obstructs other important public services of daily life besides the conveyance of passengers and goods. I was surprised at the reproach upon the government from Mr. Hawes for not having established a postal telegraph; and I trust he will join in reclamations for wiping that reproach away. But does he not see, that in giving up the main lines of communication of the railways to private and irresponsible persons, impediments are placed in the way of the most eligible lines for the economical use of that great invention? Does he not perceive that the very principles he advocates in respect to the giving up railway communication to private companies are applicable to telegraphic communication? This disunity and disorganization subjects the public to the labour of verification, to the worry and loss of time in intercommunication, which in the every day business of life is in the aggregate a serious discomfort, a drain upon the nervous energy and temper, positively detrimental to health. This is experienced particularly in such wretched places as the Clapham Junction, or other metropolitan railway junctions. Under the present disorganised practice there is a serious loss of time in seeking and going from one establishment to another. Thus, in the British metropolis, if you want to send a letter by post, you must go to one establishment; if you want to dispatch a telegraphic message, you must seek out or send to another, and commonly a distant one; and sometimes you are troubled to enquire, and decide between two competing lines. If you want to forward a small parcel you have to send your servant to hunt, and enquire, and decide between several offices. But if you are in Switzerland, at Zurich, you go to the one office and deliver your letter or send your telegram, which goes at one uniform franc rate all over the country. At the same establishment you send your small parcel, whether it be a book or anything else, at a certain uniform charge for delivery. When, a short time ago, I was in Switzerland, and made some inquiries as a matter of administrative interest, as to the application of the postal system to the telegraph and small parcel post, my inquiries were met by expressions of surprise that there should be any doubt on a matter so simple, and that the English, who were so clever and advanced in some directions, should be so absurdly stupid and backward in others, and should allow ourselves to be hoodwinked into pernicious protectionism of parcels, and irresponsible monopolies at the expense of the public in money, in safety, and in comfort. The answer to the reproach generally made by the private enterprisers on public functions, that foreigners allowed their government to do everything for them, was, "We make our government officials return full and due service for the taxes we pay and the position we give them. We do not consider that the functions of our government are merely to make perfunctory laws, to tax and to punish. We are not such fools as you English to pay twice—to pay one

set of men, who ought to be our responsible servants, and then to pay another set of men, who are not responsible, for doing their duty in disagreeable manners and at such extravagant prices as they choose to exact." Involved in the waste attendant on disunity of management is the practice of competition by duplicate and triplicate lines. It will be alleged that the principles I advocate are opposed to competition, to which it is said we owe our great commercial advances. On the contrary, it will be found that the administrative principle originally propounded here and afterwards adopted on the Continent, gives an opening for competition on the largest scale and of the most efficient description on an economical principle, which I have illustrated at length in a paper which will be found in the transactions of the Statistical Society, and which I believe most economists now recognise as sound, the principle of what I call "competition within the field," meaning for the whole field of service as against competition "within the field ending in divisions of parts of it." I have there shown that to commit two or more capitals into a competition for a service which can be accomplished by one is always a waste, generally at the public expense. Like races between heavily-weighted horses, such competitions between concerns heavily weighted by separate establishment charges must result in comparatively reduced speeds, that is to say reduced profits. I would ask where the utmost competition between duplicate lines in the same field has left us, but in fares more than one-third behind Belgium, with a disjointed, jarring, conflicting system, and far inferior means and chances in the present state of things, of future progress, and the shareholders with reduced dividends. The original foundation on which commercial men proposed railways, and on which new capital is yet continually obtained, is false in economical principle as applied to such subjects, and is in itself a proof of their incompetency to deal with it.—The next economical principle to which I have at present to advert, which I have elsewhere endeavoured to expound, is that of exactions under monopolies on necessities instead of payments for services. There is a large organic distinction between charges which have relation solely to the services rendered, and payments which are founded not on the consideration of these services by the agent, but on the view and estimate of the necessities, and on the power of exaction under monopolies on the person's means of payment and necessities of travel. I illustrate the distinction in principle by such examples as the following, which are familiar at our seaports. A belated traveller from London presents himself, say to a group of Deal boatmen, to be put on board a vessel just out of hail and about to set sail. The boatmen see, that unless "the fare" is put on board, he will lose his voyage, and probably his passage money; and instances occur where not one boat was to be had for less than five pounds or more to put the passenger on board, to do that for which the payment of half-an-hour or an hour's work in a regulated service, the payment, in fact, of as many shillings would be most liberal; whereas the payment enforced is an exaction on necessities. The whole of the Company's system of charges for the carriage of goods, not on account of any special care required, or risk in the way of insurance charges, but on account of their supposed value, or the necessity of their conveyance—charging for iron on some lines more than four times more than for coals; charging coals not for their carriage but for their quality. The progress of the productive powers of the country will be found to require that this pernicious principle of exactions on necessities should be abrogated, and the administration of the public means of communication placed in disinterested hands. For it gives to producers or distributors of one class, acting as directors, the power of wielding the means of communication for the promotion of their own trading interests, at the expense of rivals; it gives to the manufacturers of one district the power of speeding in cheapness their own produce at the expense of manufacturers and traders in others—paying for the transport of their own produce at low rates by excessive charges on passengers. By the irresponsible exercise of the powers conferred by this pernicious principle of action, they may change the distribution of the manufactures of the country, as they are charged with having, in relation to one commodity, gone far to do. It was the vicious principle of the old postal system, that no one wrote a letter unless he was obliged, and, consequently, that you might tax him as you pleased, and that any reduction of the tax would be a loss. The like assumption prevails as respects passengers amongst trading railway administrators—that no one travels unless he is obliged, and that, consequently, any reductions of fares, or any extra expense for comforts or improvements, in convenience, is simply so much revenue lost. I have little time to do more than mention the third main economical law, commonly contravened by private trading railway administrations; that of increasing ratios of consumption with diminishing ratios of prices. It is what I have called a law, that if in any given community there are (say) a thousand purchasers of an article, or payers for a service at a shilling, there will be in that same community not merely two thousand, but three or four thousand, purchasers at sixpence, and at three pence, not merely eight thousand, but twelve or more. Of course to that law there will be wide variations, which may only be determinable by very extensive observation, or by actual practice. To the operation of that law, as I conceive, we owe the rebounds of our revenue from successive reductions. To it we owe the astonishing replacement of the postal revenue, under the large reductions of the penny post. To it, I conceive, we must look for the retrieval of the country from the disadvantageous position in which by false principles of economy and legislation it has been placed, in relation to the trade of other countries, and from the discomforts and insecurity and excessive charges of its means of internal communication. Under railway competitions there have been remarkable examples which I might cite of rebounds, such as replacements of returns, under reductions of fares, by more than one-half and even two-thirds, as also of the high profits derived from excursion trains, which will be found to be not solely of passengers, who go for mere pleasure, but largely of persons who avail themselves of the opportunity of the fares being brought within their means to make visits, which they would make more frequently and regularly if the reductions were constant. With this principle for the stimulation of consumption by the reductions of price, there accommodates itself, as a means, another principle of the reduction of the proportion of paid establishment charges by distribution over the subject matters carried. The late Mr. Butler Williams, civil engineer, was so good as to get out for me some illustrative tables which will be found in a paper by him, printed in the *Journal of the Statistical Society* for 1846. Thus, supposing the original cost of construction were £31,000 per mile, and the actual working cost to be one-third of a penny (and it is now stated to have been brought greatly below that), if only 20,000 tons per annum were carried, the fixed charges would amount to 10·08d. per ton, or a a total of 10·53d. to pay five per cent., whilst if a million of tons were carried, the fixed charges, including five per cent., would be only ·20d. per ton, or a total of ·65 of a penny per ton, including working expenses. It is a fact established by railway testimony, that whether a railway train carries only fifty or seventy passengers (the actual average), or three hundred, there is no material difference in the actual working expenses per train, whilst the distribution of the establishment charges is a ratio proportioned to the numbers. The effect of the stimulus of cheap fares has, of course, its limits, and if one had a free ticket to go at any speed over all the kingdom, one would not, perhaps, often go from the Land's End to John-o'-Groats. But these limits have not been tried or de-

termined by railway companies, and it is requisite that they should be tried by an independent authority, and determined in the interests of the public. Instances have occurred where reductions of fares, by two-thirds, are stated to have given the same net returns to the companies, but because the reduced fares did not produce more to them, they discontinued them in their recklessness of the injury they thereby did to the public. Intervention is needed in such cases to secure these great advantages in behalf of the public, and to prevent them being ruthlessly sacrificed to the narrow interests of the railway directors in nothing but profit to themselves. And this intervention may yet be made, if conducted on sound administrative principles, with advantage to the shareholders, with respect to whom it may be averred that the legislature has been in default by the false principles it has maintained, and that it owes to them compensation, or at least security for the future. I am forced to advert to another false principle in legislation. Our first propositions for leasing out the main lines to work as well as to form, have been signally vindicated in France, where the people rejoice that at the end of a term of years (of late grievously prolonged in the undue interests of capitalists), when the leases fall in, they, the public, will have a large revenue from the railways, the application of which they contemplate for paying off their national debt. I shall have, nevertheless, to submit to my colleagues of the French Institute that it would be far better for the development of the productive power and prosperity of that or any other country to reduce the charges on the transport of persons and goods to the lowest cost of proper service, and to charge much of that cost as a land or income tax, rather than to exact any surplus of profit from charges on intercommunication. A toll for the maintenance of a road is only justifiable economically under exceptionable circumstances. The common commercial notion that the test of the value of a road is payment by a toll, is a pernicious fallacy. A toll only proves how many can or will pay it. This evidence viewed by itself, and apart from other facts, shuts out of view the numbers whom the toll deprives of the accommodation of the road. It also shuts out of view the value or money's worth given by the road to others than the toll takers. It is frequently the case that a road does not "pay" by a toll, whilst it pays well, directly and indirectly, in other ways. I have cited, as an illustration, the example of the Waterloo-bridge, near us, treating it as a road. As a commercial speculation it is a total failure and loss, for payment from the tolls, to the shareholders; yet whosoever will look at a map of the southern district, and see the large town which its formation has created, will see that in the increased value of the building land it has been a great success. I was consulted by the late Mr. James Morrison on the economics of this subject, which he adduced before a Committee of the House of Commons, giving instances where the increased value of land, attendant on the formation of railways, would, if capitalised, have paid well for their construction. I might prove, that in the interests of the owners of land and houses, and the leaseholders, occupiers of shops, or farms, a toll is generally as erroneous a means of charging for a public road as it would be to levy tolls on the private roads of a farm or an estate, as a means of paying for them, or of getting a rent. In some instances of branch suburban railways it would be the most economical course to charge the cost of their construction and maintenance, on the rents of houses. But an illustration of the doctrines I have advanced, as to the effect of reductions of rates on consumption, and as to the effect of tolls in impeding traffic is afforded by Waterloo-bridge, and also by the instance of the Southwark-bridge. According to the common commercial notions, no one, except mere beggars, who had occasion to cross the bridge, would hesitate to pay a half-penny, or would abstain, or go round to the free bridges, Blackfriars or Westminster, to save a toll. Yet, according to the parliamentary returns, the annual average per year, of passengers at a penny, was less than two millions and a-half; and when it was reduced to a halfpenny it was doubled. The averages yearly were, 2,389,059 at a penny, and 5,056,164 at a halfpenny. Since there would be little gain and some trouble to the officers, perhaps, from the increased numbers, the railway policy would be to return to the old fares, even to the hindrance of two millions of persons, and the ignorance of the local representatives would allow this to be done. But I would call attention to the other example of the pernicious effect of a toll as displayed by the result of its entire abolition. The number of foot passengers over the Southwark Bridge, at a penny toll, was for six months 257,616. Experimentally the toll was taken off, when the number of foot passengers for the same period was augmented to 2,359,312. The increase may be said to be nearly tenfold. That is to say, we have it here proved that a toll hindered nine times more than it accommodated. Will any one here doubt the ignorance of vestries which resist charging expenses on rates, which would tend to free communication and interchange by the removal of tolls. Our cousins in America are wont to speak of the almighty dollar as occupying their minds. We might speak of the almighty penny as a subject to occupy our minds, economically and administratively, for the freedom of trade. In Belgium where, although the railways have been conducted on our erroneous views of levying taxes on intercommunication, the fares are greatly below those in England, the Government has brought in a bill to effect a considerable reduction of them, which, as affecting minerals and the metal manufacturer, will give the manufacturers of Liege a considerable advantage over those of Sheffield. In France, as I am informed, where fares have been reduced in particular instances, and for a short time, at the instance of the Government, on extraordinary occasions, the commercial mind there has seen reason not to return to the former rates, though free to do so, and there is a rising agitation for the reduction of the rates in the interests of the freedom of trade. In Ireland, at a meeting of noblemen, gentlemen, landowners, merchants, traders, and others, that was held last week, at Dublin, on this great subject of internal communication, it was in effect determined to apply to the Government and the legislature to return to first principles;—to resume the public control over the railways; to try a considerable reduction of rates and fares; to make every day in Ireland, in fact, as relates to railway fares, an excursion day, and to defray any loss that might accrue before the former net returns are restored, by an addition to the income tax on the revenues of Ireland. It would be an imperial policy, by the reduced fares and increased speeds on this side the channel to bring Ireland nearer by one half, socially as well as commercially, to the influence of the metropolis. Looking at the position of this country, and to the extreme parts of the world from which it obtains the raw material, and returns manufactured products, estimating the vast importance of the cost of transit as an element in competition and price, can we continue to allow intercommunication to be shackled by a protectionism of many millions? To Sir John Burgoyne and various public officers it must be consolatory to perceive that experience is vindicating the great principles which, with myself, they originally contended for. It will now be for merchants, manufacturers, and the public generally who experience the continued and increasing evils of the dereliction from those principles, to try to rescue our chief means of internal communication, for the transit of goods as well as persons, from the trammels imposed by false principles, from which they rescued the postal communication of the empire, and thus set an example of sound administrative reform to all other nations. This may be done in the interests of shareholders as well as of the general public. Long as the time has been during

which I have been compelled to occupy attention, it has yet been too short to enable me to explain the chief financial means available, in my view, to retrieve the errors committed in legislative principle; which means would be, as follows:—Giving the public credit and security for the discharge of the railway debenture debts, by which at public rates from one to two and a-half per cent. might be gained; giving government security for the payment of dividends, by which some third of additional saleable value might be given to the stock without any loss to the public; ensuring the economies, available from unity of management, and contract management; freeing the railways from local and other taxation, which would cease to be chargeable if the railways were restored to their proper status, not as a mere trading speculation, for a private and taxable profit, but as public highways; reducing the expenses of future extensions on the same principle. From these economies, which are only practicable by a public amalgamation, but which might be carried out by a special executive commission, a fund would be derivable, which would be available for equitable division between the shareholders and the public;—to the public more safe, comfortable, and speedy travelling, at lower fares, and reduced rates for the conveyance of goods, as well as other services would be secured; to the shareholders some compensation and security from future loss.

Mr. Hill said Mr. Chadwick, in commenting upon the management of English railways, and in stating that the result was only 3 per cent. dividend to the original shareholders, and comparing that result with the railways of other countries, had dealt unfairly with the matter. The fact was, the difficulties which English railways had to contend with, both in raising capital and in other things, had tended to produce that result. For instance, a certain amount of capital was raised by a company, and found to be insufficient, and thus, through being impeded by legislative restrictions, they were put to all sorts of inconveniences in raising further capital. For instance, when the London and Brighton Railway had a large amount of debentures falling due, they were not permitted to borrow money at a higher rate than 5 per cent.; if they could have borrowed for one or two years at 6 or 6½ per cent., the time would have arrived when the credit of the company would have been so far established that they could probably have raised money at 4 per cent.; but they were permitted to raise a permanent capital at 6 per cent. in the shape of preference stock; and thus the railway was now burdened with a perpetual 6 per cent. stock, which was paid out of the returns before any dividend accrued to the holders of the original shares. If fair means had been allowed to raise the capital, the dividends to the original shareholders would have been considerably increased. The Lancashire and Yorkshire Company had a similar burden of 6 per cent. stock. The London and South-Western had a 7 per cent. stock, though not to a very large amount, and the Chester and Holyhead, now a part of the London and North-Western system, had even an 8 per cent. stock. He therefore submitted, it was most unfair to say that the railways in this country had produced on an average a return of only 3 per cent. on the capital invested. Surely it was unjust to charge that result upon the management of the railways of this country. Moreover, in comparing the foreign railways with the English, it must be borne in mind that in this country enormous sums were paid for land, whilst on the Continent, the government, being interested in effecting speedy communication, expropriated the land, and in that way took off a large burden from the cost of the railways. At the outset of the railway system in this country, great impediments were thrown in the way, through the want of enlightenment on the part of the public. They did not then know what railways would do for them, and so they opposed them. Abroad every facility had been given to railways, and in the fair consideration of this question, regard must be had to the difficulties under which the English railways had laboured.

Mr. Seymour Teulon remarked that while it was quite true, no doubt, that the average return upon the original capital of railways in this country was only 3 per cent., yet, when they found the public funds at 3 per cent., he was astonished that a man of Mr. Chadwick's acuteness of calculation should bring that forward as an instance that the Government would be likely to pay a better dividend on the railways. It was true the ordinary stock paid an average of only 3 per cent., but it was equally true that a large number of railway stocks paid a higher per centage, because Parliament, in its wisdom, had said—after a railway was once made, additional capital should only be raised in a certain way; they might raise additional capital by preference shares, and they had a certain amount of debenture power, and all this tended to keep down the original stock. But there was another cause which contributed to the same result, the heavy charges for rates and taxes imposed on the railways. He believed the quantity of land ordinarily taken for the purposes of a railway was estimated at 10 acres per mile for the line itself. That land might be fairly reckoned at £1 an acre, as agricultural land, throughout the kingdom; but he would add 50 per cent. to that, and take it at 30s. per acre. He had calculated the amount of local rates in a large number of parishes, contributed by railways, and the average was 3s. 6d. in the pound. What was the result? That on a railway 315 miles in length, the poor-rates, church-rates, and highway-rates, without tithes, amounted to £26,000 per annum. In other words, it amounted to above £83 per mile, or £8 per acre paid by the whole of the railway on land which, at the ordinary assessment of other property (putting 50 per cent. on the value for agricultural purposes), would only be 4s. 6d. per acre! Could it therefore be said that the railways were on the same footing as the old turnpike-roads, maintained by tolls? He would go a step further. On the same railway, the rates, taxes, and Government duty, for the year ending July last, amounted to £217 per mile. Thus, without allowing one farthing for the expenses of working that line, more than four weeks' to talrecepts of that railway at this period of last year, were absorbed in these charges. Was it to be wondered at then that the original shareholders should receive only a small dividend? Another point alluded to by Mr. Chadwick was wages. What had been the effects of railways upon wages in agricultural parishes? He would tell them what been the effect in his own parish as a landowner. Wages which, some thirty-five years ago, were 9s. per week, were now 15s. in summer, and labour was scarce. Where had the agricultural labourer gone? He was employed upon the railways, attracted there by higher wages than the farmer could give; therefore railways had very materially increased the value of labour. They had placed the labourer in a better position than he was in before. Nevertheless railways had to pay higher rates of wages, and it was only right they should, for they wanted a more intelligent class of men. With regard to the overworking of the servants on railways, he would only say it was not the case in the company with which he was connected.

Dr. Pankhurst remarked that in the paper of Mr. Hawes, in the address of Mr. Galt, and in the supplementary communication of Mr. Chadwick, they had the three views which at present occupied the public attention on this subject. Mr. Chadwick had started by saying that the railway management of this country was defective and unequal to the situation, and that therefore it should be transferred into the hands of the government, that was to say, because it was not such as was approved of by the general public, there were sufficient grounds to destroy the present system. Mr. Chadwick, however, admitted that government administration in many particulars required improvement. It might, therefore, with equal justice be said that in those instances its administration should be abolished. But he asked whether, if the railway system, on that unity of

management which Mr. Chadwick wished for, were in force, and if the economical law which he insisted upon were carried out to the full, whether it would be right to farm out the railways to be worked on commercial principles at all. Mr. Chadwick said they ought to give to the public the power of passing from place to place at the bare cost of transmission; therefore it was not sufficient for him to show that railway management was defective. On the contrary, if it were perfect, still his position would be equally strong; for if the lowest point of reduction of fares were found out, and the largest return produced, still there must be some profit; but that profit, on Mr. Chadwick's system, ought to go into the public purse. Were they prepared, however, to admit that principle—that the great system of railway communication was no longer a subject of mercantile profit? That was the real point at issue; and Mr. Chadwick's view was, in his (Dr. Pankhurst's) opinion, so destructive of the free enterprise of the country, that he was persuaded, on political if not on economical grounds, they would not be disposed to agree with him. Mr. Galt did not go so far as that. He had contended for an uniform rate of charge for fare and conveyance over the whole kingdom. That was possible, even though the commercial system of railway enterprise were maintained. Of course there could not be a low uniform rate without unity of management, and there could hardly be unity of management without government control; and there could not be government control without government ownership. Were they, however, to throw the railway system out of the field of commercial enterprise? Mr. Chadwick had brought forward the experience on the continent, but the continental theory of government was not such as we should be inclined to accept; and the railway system there was a consequence of the system of government. Mr. Chadwick had characterised our railway system as an irresponsible enterprise. It was nothing of the kind, inasmuch as the powers were given upon certain conditions; and if they had any ground of complaint, it was, in the first place, that they had not made sufficient conditions, and next, that they had not sufficiently enforced the conditions which had been made. The railway system was a mixed one; it was partly a monopoly, and partly a subject of enterprise. In the extent to which it was a monopoly, its powers were controlled by the legislature; to the extent to which it was free enterprise, the shareholders might be left to make the most of their position, and to do the work in the most economical way. What, then, was really wanted? Adequate Parliamentary powers of inspection and control; especially with reference to the public safety; for it could not be denied that overworking the people engaged, so as to render them physically disqualified to attend to the duties assigned to them, was an offence against the public. Government control was also wanted in regard to affording proper facilities of transit by Parliamentary and workmen's trains, and as to the amount of the fares that should be levied; and he considered they might then relieve themselves of more than half the objections which had been raised by Mr. Chadwick, and yet leave the splendid monument of our railway system free and unshackled by so vicious a principle as was now sought to be introduced into it.

Mr. W. Botley agreed with the general tenor of Mr. Hawes's paper, for which he considered they were much indebted to that gentleman. At the same time they must all agree that, if the Government as well as engineers had possessed the gift of prescience, it was very probable that the railway system of this country would have been carried out in a different way. But they must now deal with the matter as they found it. He would confine the few remarks he ventured to offer to the monetary effects consequent upon the adoption of the system advocated by Mr. Chadwick, that the Government should be the possessors of the railways. At the end of the year, 1864, the official returns showed an amount of 425 millions invested in railways, and in the last year a further sum of several millions had been placed in the hands of the Accountant-General in Chancery for public works projected, so that at the end of the present year there would not be a much less sum than 500 millions invested in the railways of this country. Supposing it were possible for the Government to hold that vast amount of capital, what would be the influence upon the monetary state of the country. What would be the consequence if the Government took upon themselves this additional burden of 500 millions? There would be that addition to the national debt of the country, which would so derange its monetary interests as not only to upset all future enterprise, but to sap the foundation of the commerce of the nation. Therefore, in a financial point of view, he considered the scheme would be so detrimental to the enterprise of the country, that no legislature would ever give their sanction to it.

Mr. Brereton did not gather, either from the paper of Mr. Hawes, or that which had been read this evening in reply to it, that any such intention as the purchase of the railways by the Government ever existed, therefore they were attacking a shadow rather than a substance. Mr. Chadwick had quoted the views of several eminent engineers on the general railway system of this country, but he did not find that any of them advocated that the Government should be the purchasers of the railways. The late Mr. Stephenson was so far a protectionist that he objected to the introduction of new lines into a district that was properly served by existing ones, and he had never suggested that the Canadians should endeavour to improve upon the English system, except by avoiding this mistake, while the remarks of Mr. Bidder only went to the extent of suggesting that means of working the lines should be adopted so as to give larger returns to the shareholders. He did not think Mr. Chadwick had made out a case to show that if such a wish had ever existed, any advantage would result from it. He agreed with the remarks of a previous speaker, that the comparison between the results of continental railways and those in England was not a fair one. The railway system abroad was commenced under the advantages of a considerable amount of experience obtained from this country. He had had some considerable experience in the workings of railways in this country and abroad. In Australia the whole of the railway system had been constructed and worked by the Government, and at the present moment, after an experience of ten years, the Government of Victoria were seeking to relieve themselves of the responsibility of the further working and management of the lines in that colony; and that step had been taken after obtaining ample information as to the working of the continental lines. He thought this was a case in point, showing that governments were not always the best managers of such enterprises.

Mr. Allport said he should not have risen, but that Mr. Chadwick had done him the honour of alluding to his evidence before the Royal Commission on Railways. He scarcely gathered from that gentleman's remarks his object in quoting from that evidence, but if it was done to convey the impression that he favoured the notion of government interference and government management, he would state most distinctly that his evidence was exactly the reverse of that. [Mr. Chadwick said that the evidence referred to went to show that Mr. Allport's attempt to introduce uniformity of rates by private agreement had failed.] What he had stated was that uniformity of rates would, in his judgment—speaking after twenty-seven years' practical experience as a railway manager—be utter destruction to the trade of this country. He said that most advisedly, and after the fullest consideration of the subject; there was no question which, perhaps, engaged the attention of railway managers so much as that of rates. To take his own case—assuming that on the Midland Railway, of which he was the manager, they had a uniform system of rates, what would be the result? The principal traffic on the

Midland line was minerals and coal. Sixteen years ago the entire coal traffic on the line was under a quarter of a million of tons; it was now between six and seven millions. If a uniformity of rates were attempted one of two things must happen—either the rates must be so raised for the long distances that the coal would cease to go to London, the west of England, and all other parts of the country, or, for the shorter distances, the rates would be so low that the railway company would cease to pay interest upon its capital. They were obliged to charge such rates as would develop the resources of the district, and when he spoke of sending coal to London it might be information to some present to state that the entire quantity of coal brought by railway to the London markets amounted to about 2,500,000 tons a year, about 1,400,000 tons of which came from collieries on the Midland Railway, and the average charge for this did not exceed three-eighths of a penny per ton per mile. But it would be utterly impossible for a railway company to conduct its business, if for short distances of thirty to fifty miles they were compelled to charge that low rate. He referred more particularly to coal because it was a very important item in railway traffic, but the same remark applied to a great variety of articles. It was the object of railway managers to develop the trade of each particular district. He might mention silk especially. That trade had been established for many years at Derby, and occasionally as much as from ten to twenty tons of silk were carried by the railway at a time. If uniformity of rates were adopted, and the carriage of silk goods were charged uniformly throughout the country, the result would be that instead of encouraging the development of a particular manufacture, the rates for silk must inevitably be advanced to at least three times the present charges. It was the same with the iron trade. Who would dream of taking a few tons of pig-iron to a small village or foundry at the same rate as would be charged for the enormous trade in pig-iron from the Cleveland, the Staffordshire, or Welsh districts? If uniformity of rates were established it would entirely destroy that large trade. He could in the same way instance other trades. Mr. Chadwick had said a great deal about competition. He (Mr. Allport) thought it had been for the benefit of the country that they had had competition on railways. He was not one who advocated that no new railway should be made because other companies were in possession of a certain district. He did not think there had been many railways made in this country which were not wanted, and the competition which had been brought to bear upon the older railways had had the effect of benefiting the country very largely; but if they put the railways under the charge of the Government, what would become of competition? It would cease entirely. There would be no motive for developing the resources of any district of the country or any particular trade. He would say on behalf of the railway interest, with which he was connected, that there was no power in this country which had tended more to develop its resources and to promote its commercial prosperity than the railways had done. He would mention one fact, which he stated at a meeting in the presence of the Chancellor of the Exchequer. About sixteen years ago, the exports of this country amounted to fifty millions per annum, and there was a great outcry in the public papers that the trade of the country had become inflated, the *simile* used by the *Times* being that of a large balloon that only required some accidental rent to cause the whole thing to collapse. It was argued at the same time that it was impossible to continue an export trade of 50 millions, but in the short period of sixteen years it had amounted to 150 millions. Who talked about inflation now? He saw no reason why it should not be 300 or 400 millions. To what were they indebted for this enormous expansion of the trade of the country? Not to the old roads and canals, but to the railways, and he maintained that the greatest benefit conferred upon this country had been through the railway interest. Look at the district of South Wales alone; a dozen years ago who ever heard of the South Wales district? There were a few collieries open, and one or two large iron-works, but it was entirely through the railway system that it had now become one of the most important mining districts in the kingdom; and he said fearlessly that that trade had been developed solely by the railways; and he said as fearlessly that, with the railways in the hands of Government, South Wales would have remained very much in the same state as it was a dozen years ago. With regard to the Government purchase of railways, he would ask whether any gentleman present would like to see the national debt increased by 400 or 500 millions. He did not think this would find many advocates in the House of Commons. Then, again, look at the patronage involved in such a scheme. Would any one like to see in the hands of the Government the patronage of between 120,000 and 130,000 *employés*. Was that a desirable thing? They complained now of Government patronage at seaport and other towns; but if they placed the railways in the hands of the Government, there was scarcely a town in the kingdom that would not give (unless they were disfranchised) a very large number of votes to the Government. He thought that of itself was sufficient to prevent the railway system passing into the hands of the Government. A good deal had also been said about the low fares charged on the continental railways; but it was to be borne in mind, as had been already remarked, that in almost every case the land had been given by the Government; and in many instances the works had also been executed by them, and the companies leased the lines, merely finding the permanent way and rolling stock. He believed nearly the whole French railway system had been carried out in that way, and the Government of late years had been increasing the terms of the leases to the companies. Other Governments had been disposing of the railways to private companies; it was, therefore, quite clear to his mind that foreign Governments had not found railway working and management so beneficial or desirable as had been stated. It was perfectly true that turnpike roads were free, and were not subjected to the rates and taxes which were such a great source of expense to the railway companies. He could mention many parishes through which the Midland Railway passed for only a quarter or half a mile, and yet in which the railway paid half of the rates of the parish. This was a very serious expense, and he believed that the same thing had entered into the expenses of almost every railway company in the kingdom. As to wages, there was no doubt (as stated by Mr. Teulon) that railway companies very materially increased the scale of wages throughout the country. Mr. Chadwick laid great stress upon the words "disunity," "disjointed," &c. He seemed to imply that it was impossible to send a passenger, a parcel, or goods beyond the limits of each particular railway. In fact, a stranger to the railway system would suppose, from what Mr. Chadwick had said, that it was impossible to get a parcel booked from London to Aberdeen, or to any distant part of the country, on account of the many conflicting interests which would be brought into play. But what was the fact? It was well known that they could go to any station in London, and book to any place they pleased, not only in England, but in Ireland or Scotland. It was true that they had a choice of route, and for that they had to thank competition. The railways had worked uniformly for the interest of the public, and the public had derived very much greater benefit than the shareholders themselves. He believed the saving to the public in the carriage of goods alone was more than three times the interest paid upon the national debt. He remembered the time when a ton of Manchester goods was charged £8 to London, whereas the highest charge at present was 35s., and large quantities were only charged 20s. If any change were con-

templated in the present charges, he was quite sure that there could not be a much further reduction, either for passengers or for goods. A good deal had been said by Mr. Chadwick about low fares inducing people to travel, but this had not been his experience. He had tried high, low, and medium fares, but he had found that people would not travel unless they had occasion to do so. There was really no analogy between passenger traffic and the post office. He did not think there would be much gained if the fares were reduced to one-half the present scale. He admitted that, in some cases, experiments might be tried, but, as a general rule, he believed that railway companies were able to find out what was the scale of fares which brought the largest number of travellers upon their railways.

Mr. Hawes, in reply, said he felt that there had really been no argument at all brought forward in opposition to the views which he had enunciated. Mr. Brereton in repeating the statement, made in Mr. Galt's speech at the previous discussion, that there was no proposition before the public for the purchase of the railways, had no doubt been led into an error because he had not read Mr. Galt's work. The very first passage in this book—which was a very thick one, and contained everything that could be said upon this question—stated that "in 1844 an Act of Parliament was passed for the purpose of enabling Government to purchase, on certain specified terms, all the railways in the United Kingdom;" that act could not come into operation till 21 years had elapsed, and the 21st year was 1865. His book showed that Government had the power of purchasing the railways; it was published to point out what advantages might be derived if the Government exercised that power. The case he had supposed, therefore, was not an imaginary one, as Mr. Brereton had assumed it to be, but there was the positive fact before them that an act of parliament existed, giving the government the power to enter into a treaty for the purchase of all the railways. Then Mr. Galt, who was supposed to have considerable influence with a member of the administration, had published a book on the matter, and Mr. Chadwick was endeavouring, as he always was, to insist upon the benefits of centralisation, and to show that the government could do much better than any body else, and that they understood the wants of the public better than the public understood them themselves. Both these gentlemen, then, were advocating the handing over the greatest work that had ever been produced in the world to a government whose antecedents showed, as did those of all governments, that whenever they attempted to carry on mercantile transactions they always failed. Had he, or had he not shown this to be the case? Mr. Chadwick, in the paper which he had read, had not touched one of the allegations which he had brought forward to show that Government could not succeed. Mr. Chadwick had not proved that as soon as the penny postage system was announced the Government took Sir Rowland Hill into its employ so as to administer the system. The fact was that for years the Government would not employ him, until he was forced upon them by the public, and it certainly was extraordinary that Mr. Chadwick should have referred to the post office in support of his views. It was also very remarkable that Mr. Chadwick should say what he did about ocean steamers. He said that the mail service could be performed better by Government than by individuals; and he added that if they would only give naval officers the same ships as those employed by individuals they would perform the duty as well. What he (Mr. Hawes) would reply to that was, why did not the Government give such ships to their officers? They had left the providing of the ships to private individuals and to those great companies who had now proved how efficiently such services could be performed. Then he came to the question of the electric telegraph. He had only alluded to this in his paper to show that Government did not appreciate public wants, that the greatest of all modern inventions was entirely neglected by the Government, and that but for private individuals taking it up in the first instance Government would have left the matter alone till the present time. What said Mr. Chadwick about this? Why, that this service was connected with the railway interest, which was a monopoly, and therefore that public telegraphy became impossible. But did not Mr. Chadwick know that there was a telegraph company running across the country in all directions, quite independently of railway lines, and that abroad telegraph wires were laid irrespective of railways? If the Government had chosen they might have put up telegraph lines altogether independent of the railway interests. Then there was a great anomaly to which he must refer. At the present time the Government carried the letters, which paid a hundred per cent. profit (for the surplus income of the post office was now very nearly two millions), and telegraph companies carried the most important messages and despatches for the Government. Everything of that kind that was of importance, and that involved risk, was given up by the Government to private enterprize, while the government themselves were content to go slowly along on the old system of the post. In all these respects Mr. Chadwick failed in his argument. If it were true, as he stated, that in dockyards and shipbuilding private enterprise failed, why did the Government still avail themselves of private enterprise? Why did they employ Sir Wm. Armstrong to make their guns, or Sir Morton Peto to go to Balaclava? Why did they employ private contractors instead of doing the work themselves. With regard to the rates and fares to be adopted, it appeared that Mr. Chadwick had no fixed ideas upon this point. Was the Government, then, to make experiments to find out what was to be charged? This would only be making the matter worse, because we should be giving up a system of railway management, in which all this was settled, for one which had yet to find out whether they would charge dearer or cheaper than was charged at present. As to the demand for low fares, what more could be wanted than to go from London to Brighton and back—over a hundred miles—for 3s. 6d. As to the foreign lines, Mr. Chadwick had not told them that on the Swiss lines the luggage was charged for independently, and that a man paid almost as much for his portmanteau as he did for himself. Mr. Chadwick had not said anything about the differences between the state of property on the continent and in England. Were they prepared to give up their property in the same way as it was disposed of there? He thought not, and for his own part he would infinitely prefer to pay a higher price for the railways than give up those rights of property which Englishmen so dearly prized. At that late hour, and after the full discussion that had taken place, he would not detain them longer, but he hoped the time was very far distant when such a change as had been talked of would be made. Mr. Chadwick, who was deeply read, and whose memory never failed him, quoted Jeremy Bentham. He told them that he "quoted the words of a great thinker." There was no doubt that Jeremy Bentham, was a great thinker who lived many years before railways were thought of. But they were living now in days of action, and they wanted more men of action, and not merely thinkers. There were many such among railway directors and managers who would, in the actual business of the world, beat the "great thinkers," who were so much quoted—even such great men as Jeremy Bentham.

The Chairman said he would not detain the meeting at that late hour, especially as he had already expressed in that room his opinion on the Government management of railways. He wished, however, to make one remark. His friend, Mr. Chadwick, had said that he had on his side four of the past presidents of the Institution of Civil Engineers. He must say that Mr. Chad-

wick had no right whatever to bring the names of those gentlemen forward as supporters of his views. He knew them all well; two of them were no longer alive to speak for themselves; but he really did not know of anything more likely to bring them out of their graves, if such a thing were possible, than the fact of Mr. Chadwick leading a public meeting to infer that they had ever been advocates for the Government of this country taking the management of the railways. With regard to the other two gentlemen, they were both alive, and would probably read what Mr. Chadwick had said, but he (the Chairman) was certain he might now say for them that he did not know two men further removed from any views such as those advocated by Mr. Chadwick. When they were told that they were advocates of the Government management of railways, he believed they would be very much astonished. For his own part, he differed from Mr. Chadwick's conclusions, though he admitted some of the facts he had adduced. He did not mean to say that the railway system was perfect. Nothing was perfect, but he believed the present system was a better one than they would have had if the railways had been under the control of Government. He believed it would be one of the most destructive measures that had ever been brought foward if the government should even propose to take the railways into their own hands. He felt quite certain, however, that they were fighting a shadow, because, though Mr. Galt might have proposed such a thing, he felt perfectly satisfied that the Government never had such a notion, and never would have. He quite agreed with Dr. Pankhurst, that unless we adopted the constitution of the Continental governments it could never be supposed that our Government would take upon them the management of the railways. He would now only propose a cordial vote of thanks to Mr. Hawes for the very able paper which he had read to the Society some weeks since.

The vote was passed unanimously.

Mr. Thomas Harrison, in a letter to Lord Lyttleton, asks—"Why an approximation to our simple and easily worked penny-postage system should not, or could not, be adopted on railways, thus doing away with cumbrous, slow Parliamentary trains, and also with return tickets, excepting so far as that a passenger may pay his fare both ways at one payment, simply making all first-class fares 2d. per mile, and all second-class fares 1d. per mile, any distance and by any train. I believe such an arrangement would work beneficially in every way; it would encourage local traffic to a great extent, many working people only travelling by penny-a-mile trains now, however great their requirements; it would admit of much more uniformity in timing trains for starting, as of course express trains would not be so much required, and when they were necessary, then 3d. and 1½d. per mile might be charged."

Proceedings of Institutions.

West London Youths' Institute.—The Dean of Chichester presided on Friday, the 2nd February, at the distribution of prizes and certificates gained by the members of this Institute, in the Examinations of the "Metropolitan Association for Promoting the Education of Adults." The Dean was supported by Lieut.-Col. Fyers, Revs. J. P. Gell, H. Brooks, C. E. Donne, H. White, and a number of local clergy and gentry. The Rev. G. B. Macilwain and Mr. H. H. Sales attended as a deputation from the Association. The Dean, after expressing his great interest in the business of the evening, remarked that the word "success" was little understood. In all classes of society there were a large number of persons who would not avail themselves of the advantages placed within their reach, whatever these advantages were, therefore an institution might be successful although numbers in its locality made no use of it. The Institution was of value, because it afforded the members the advantages of a liberal education. He rejoiced to find that the importance of religious influence was not overlooked. After commending the Examination Scheme he proceeded to deliver the prizes. The Revs. G. Macilwain, H. Brooks, and H. White, then spoke in explanation of the work of the Association to the candidates, and upon Youths' Institutes respectively. The meeting terminated with a vote of thanks to the chairman, moved by the Rev. J. P. Gell.

Correspondence.

Labourers' Dwellings.—Sir,—I regret that I was unavoidably absent, as a Member of the Society of Arts, at the discussion of the paper read by Mr. Beggs, as to the Dwellings of the People. If I had been present I should have been enabled, amongst other things, to have corrected his singularly inaccurate statement as to the business of the Conservative Land Society. Mr. Beggs, according to your report, said:—"The Conservative Land Society, according to the last 'Report,' has bought 66 estates, containing 620 acres, and making about 4,842 allotments. The total amount of subscriptions received by that Society is £394,966." Now I make no complaint that Mr. Beggs confined the statistics of our Society to four lines, whilst he devoted some hundreds of lines to the National Land Society and the British Land Company, of both which he is a director; but if he thought proper to cite the Conservative Land Society as an illustration of the extraordinary progress made by building societies, he might just as well have asked for the returns from the office, up to the present date. I know not to what report Mr. Beggs alludes,—it must be a very old one,—and yet I can find no trace of his figures. But I beg to annex our latest returns:—Number of shares of £50 each, issued to date, 23,787; subscribed capital, £1,189,350; cash received since the formation of the Society, £902,561 12s. 11d.; estates purchased, 68; number of acres, 660; number of allotments, 5,661; amount of land sold, £438,595 9s. 5d.; cash advanced to members on security to enable them to purchase land, houses, or to build, £347,713 10s. 1d.—I am, &c., C. L. Gruneisen, Secretary to the Conservative Land Society.

Norfolk-street, Strand, Feb. 3, 1866.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, 8½. Mr. W. Chandless, "Ascent of the River Purus, a tributary of the Amazons."
British Architects, 8.
Society of Arts, 8. Cantor Lecture. Mr. Fleeming Jenkin, F.R.S., "On Submarine Telegraphy." (Lecture III.)

Tues... Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. William Humber, "On the principles to be observed in the designing and laying-out of terminal and other railway stations, repairing shops, engine sheds, &c., with reference to the traffic and the rolling stock."
Zoological 8½.
Syro-Egyptian, 7½.
Photographic, 8. Annual meeting.
Ethnological, 8. 1. Mr. Crawfurd, "On the physical and mental characteristics of the European and Asiatic races of man." 2. Mr. T. Valentine Robins, "Notes and Sketches on the Niger."
Royal Inst., 3. Professor Tyndall, F.R.S., "On Heat."

Wed.....Society of Arts, 8. Mr. G. R. Burnell, "On the gas supply of Paris."
Graphic, 8.
Microscopical, 8. Annual meeting.
Literary Fund, 3.
College of Preceptors, 7½. Mr. John Jenkins, "On the Philosophy of Education."

Thurs...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Dr. Welwitsch, "On the probable fossil origin, and the geographical distribution, of gum copal in Angola."

Chemical, 8.
Numismatic, 7.
Royal Society Club, 6.
Royal Inst., 3. Professor Tyndall, F.R.S., "On Heat."
FRI.......Philological, 8.
Royal Inst., 8. Colonel Sir H. James, F.R.S., "On the Ordnance Survey of Jerusalem."
Geological, 1. Annual meeting.
R. United Service Inst., 3. Mr. Marshall Hall, "A sketch of the Militia, past and present."
SAT.......Royal Inst., 3. Professor Westmacott, R.A., "On Art Education and how works of Art should be viewed."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 7th July*, 1865.

430. Convocation—Return.
432. Civil List Pensions.
434. Thames Conservancy—General Report for 1864.
440. Colliers (Ireland)—Return.
443. Chamber of London—Accounts.
Expenses of Passages—Correspondence.

Delivered on 8th July, 1865.

416. Post-office—Return.
Ionian Islands—Act containing the Accession of the Sultan to the Treaty concluded March 29, 1864.

Delivered on 11th July, 1865.

390. Open Spaces (Metropolis)—Second Report and Evidence.

Delivered on 13th July, 1865.

North America (No. 10) (1865)—Further Correspondence respecting the Cessation of the Civil War.
Drawbacks on Sugar—Convention between England, Belgium, France, and the Netherlands.

Delivered on 14th July, 1865.

Births, Deaths, and Marriages—Twenty-sixth Annual Report.

Delivered on 15th July, 1865.

398. Mines—Report from Committee.
426. East India (Engineers' Establishments, &c.)
436. Dockyard Superintendents—Return.
444. East India (Machinery in Jails)—Return.
451. Inclosure Commission—Return.
453. Friendly Societies (Scotland)—Report by the Registrar.
454. Carlisle Cathedral—Return.
468. Courts of Justice—Copy of Commission.
478. Bankruptcy—Return.
480. Militia (Ireland)—Returns.
482. Municipal Boroughs (Ireland)—Abstract of Statement.
484. Science and Art Department—Statement of the Expenditure.
466. East India (British Burmah).

SESSION 1864.

507 (D.) Poor Rates and Pauperism—Return (D.)
552. Numerical List and Index to the Sessional Printed Papers of 1864.

Delivered on 17th July, 1865.

Public General Acts—Cap. 51 to 127.

Delivered on 2nd August, 1865.

52 (VI.) Trade and Navigation Accounts (30th June, 1865).
374. Civil Contingencies Fund—Account.
376. Universities and Colleges—Return.

Patents.

From Commissioners of Patents' Journal, February 2nd.

GRANTS OF PROVISIONAL PROTECTION.

Animal substances, preserving in a fresh condition—138—D. F. Lecocq.
Beetroot sugar—225—G. J. Bensen.
Blowers—150—J. Stephens.
Bodies, lifting tackle for recovering submerged—54—T. W. Roys.
Bolts—207—D. Jones and J. Upton.
Boots and shoes—2750—G. Haseltine.
Bottles, packing—205—J. R. Butchart.
Breech-loading rifles, projectiles for—92—T. A. Blakeley and J. Vavasseur.
Bricks, &c.—122—C. G. Johnson.
Cap and cup frames used in spinning, lubricating the spindles of—160—E. and T. Feather, and J. Luty.
Carding engines—201—J. Dearden and E. P. Holden.
Coal, getting—94—C. Bartholomew.
Coal scuttle—158—J. Banfill.
Cocks, taps, and valves—102—W. J. Walsh.
Cotton balls—213—N. J. Amies.
Electric telegraph apparatus—165—C. and S. A. Varley.
Electric telegraph apparatus—237—S. M. Martin and S. A. and F. H. Varley.
Fabrics, circular frames for making looped—134—R. A. Brooman.
Fabrics, extracting wool from mixed—3378—A. and J. Knowles, and J. Barraclough.
Fabrics, folding—2550—R. Tonge.
Fire and thieves, protecting property from—96—W. A. Ruffling.
Floors, paper for covering—114—W. R. Lake.
Gas—91—P. A. Batchelor and F. Reddall.
Gas burners—185—W. Bunger.
Grain, drying and cleaning—109—R. T. Sutton.
Gumaline, converting refuse of starch, &c., into—3309—W. H. Dobs[...]
Intaglio plates, printing from—239—J. W. Swan.
Iron and metallic bedsteads—157—T. Allen.
Jiggers, self-acting—129—W. Holdcroft and J. Wood.
Lithographic presses—171—F. Cole.
Locks—48—F. Tolhausen.
Locomotives, feed water heaters for—197—S. F. Allen.
Materials, composition for coating—235—J. M. Watt.
Mattresses and palliasses—145—S. Dummere.
Nails and spikes—146—G. Meller.
Ordnance—46—H. Ames.
Ores, crushing and pulverizing—241—J. Jones.
Paper, albumenized—66—J. Skinner.
Paper pulp—149—C. H. Roeckner.
Papers, &c., fasteners for binding—104—A. H. Hart.
Paper, treating wood for making—35—W. Clark.
Paraffin, &c., lamps for burning, without a glass chimney—263—[...] Rowatt, jun.
Pen-holders, supplying the pen with ink—183—H. Dean and G. [...] Wheeler.
Plant, obtaining fibre for spinning from a—107—E. and H. Sutherland
Potatoes, preserving—100—F. J. King.
Pumping engines—175—J. Shekleton and J. W. Gibson.
Railway breaks—156—J. Kennedy and R. Stanley.
Railway signals—128—J. Irwin.
Rocks, forming tunnels and galleries in—58—H. N. Penrice.
Sash fastenings—215—T. Baker.
Sewing machines—209—G. B. Woodruff.
Ships' compasses—227—E. Hopkins.
Ships, propelling—126—J. Hamilton.
Shirt studs, &c., fastener for—153—M. Allies.
Siphon—217—R. H. Bore.
Stamps, damping and affixing adhesive—3235—W. Gill and R. Bis[...]
Steam boilers, preventing incrustation in—3122—J. Toth.
Steel and iron—154—F. Preston.
Studs and buttons—187—J. McClenahan.
Submarine telegraph cables—196—T. Hutton.
Surveyors, "plotting" and "computing" scales for—90—H. Dean.
Timber, preserving—124—A. Prince.
Travelling cranes—211—B. Walker and J. F. A. Pflaum.
Tube brushes—139—C. Moriarty.
Typographic printing apparatus—243—W. Clark.
Umbrellas—179—M. Jackson.
Water closets—199—J. Broadfoot.
Weaving, looms for—118—W. Cradd and J. Moore.
Weaving, pickers used in looms for—3094—R. Edmonson.
Weighing machines—108—J. M. Napier.
Winding apparatus—141—M. A. Muir and J. McIlwham.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Iron ships, applying copper sheathing to—257—F. L. Roux.
Magnesium, burning—261—G. T. Bousfield.
Weaving, looms for—236—G. T. Bousfield.

PATENTS SEALED.

2022. J. Gaukroger & J. Dodgson.	2128. N. C. Szerelmey.
2043. A. A. Foubert.	2133. P. Lawrence.
2047. L. J. Crossley.	2165. H. Willis and G. Hiss.
2050. W. C. Dodge.	2223. W. Clark.
2051. M. P. W. Boulton.	2367. F. Meyer & J. W. Freest[...]
2059. J. H. Radcliffe.	2643. W. H. G. Jones.
2064. C. West.	

From Commissioners of Patents' Journal, February 6th.

PATENTS SEALED.

2060. G. and A. Harvey, jun.	2113. J. Smith and W. Schofiel[...]
2067. B. Russ and E. Gandell.	2116. J. H. Johnson.
2070. L. Schad.	2135. A. and W. Young.
2071. M. H. Blanchard.	2139. J. L. Naish.
2073. J. and H. Ingham and J. Broadley.	2222. I. and W. H. Bailey.
2074. C. O. Crosby.	2247. W. E. Newton.
2077. T. Allcock.	2381. A. V. Newton.
2085. T. E. Stephens.	2465. A. V. Newton.
2089. J. Tatham and J. Smith.	2789. W. Whittle.
2091. W. Bullough.	2816. J. K. Farnworth.
2093. W. Betts.	3160. F. Dahis.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

307. W. G. Valentin & F. Levick.	319. B. Russ.
325. W. Betts.	321. J. A. Manning.
430. J. Gimson.	326. H. Dircks and J. H. Pepp[...]
304. J. Fletcher and H. Bower.	328. R. A. Brooman.
305. A. T. Blakely & J. Vavasseur.	390. J. Robertson.
314. G. T. Bousfield.	568. S. Williamson.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

276. J. Robertson.	312. S. D. Davison.
439. J. Breeden.	301. S. Tearne.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 16, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

February 21.—"On Modern Legislation in regard to the Construction and Equipment of Steam Ships." By Thomas Gray, Esq., H.M.C.S.

February 28.—A Report by the Secretary on the results of the Art-Workmanship Competition, from its commencement, will be read, and a discussion taken upon it. The competitors and Art-workmen generally are invited to attend.

Cantor Lectures.

The next lecture of the course, on "Submarine Telegraphy," by Fleeming Jenkin, Esq., F. R.S., will be delivered as follows:—

Lecture IV. Monday, February 19.

Electrical Tests.

1. *Terms used.*—Electrical resistance, Ohm's law, resistance of battery, units of resistance, resistance coils, galvanometers, Thomson's galvanometers.

2. *Tests of Conductor.*—(*a.*) Meaning of "good conductor," object of having a good electrical conductor. (*b.*) Method of measuring resistance, Wheatstone's differential measurer. (*c.*) Specific resistance of pure metals in B.A. units; annealing. (*d.*) Effect of temperature; specific resistance of pure copper at various temperatures. (*e.*) Effect of impurities; quality supplied for various submarine cables. (*f.*) Specific resistance of German silver and some other alloys and their uses. (*g.*) Use of resistance test to determine temperatures. (*h.*) Continuity test.

3. *Tests of Insulator.*—(*a.*) Meaning of the words, "good insulator," object of having a good insulator. (*b.*) Test of leakage. (*c.*) Resistance to conductor across the insulator from the copper inside to the water outside, and method of determining the resistance. (*d.*) Effect of continued electrification. (*e.*) Effect of temperature on insulators. (*f.*) Resistance per knot of various insulators in cables actually manufactured. (*g.*) Specific resistance of various insulators at various temperatures in terms of B.A. units. (*h.*) Effect of pressure on insulation of gutta percha and india rubber. (*i.*) Effect of the absorption of water on the same materials.

4. *Tests at Sea.*—Object of tests. Thomson's marine galvanometer; effect of rolling of ships; of earth currents; system recommended.

The lectures commence each evening at Eight o'clock.

Institutions.

The following Institutions have been received into Union since the last announcement:—

Bollington, Useful Knowledge Society.
Congleton, Mechanics' Institute.
Droylesden, Educational Institution.
Pendleton, Mechanics' Institution.
Southport, Athenæum.

Artistic Copyright.

In compliance with the wishes of the gentlemen who addressed the Council on this subject, in the memorial already published in the *Journal* (p. 173), the Council have appointed a Committee to take the necessary steps for accomplishing the objects specified in the memorial, more especially as relates to Copyright in Engraving. The Committee will consist of the following gentlemen:—Mr. Wm. Hawes (Chairman of the Council), Sir Thomas Phillips, Messrs. D. Roberton Blaine, F. Hamel, S. Redgrave, Edward Smith, and E. M. Underdown,

Trade Marks Committee.

The Council have appointed a Committee, in accordance with the following resolution:—

Resolved—"That a Committee be appointed to inquire into the laws of England and foreign states upon the subject of Trade Marks, and to consider if any and what amendments are advisable and essential for the purpose of efficiently protecting the owners of trade marks against the piracy thereof; such Committee to communicate with any committees formed with a similar object in the United Kingdom and foreign countries."

The Committee consists of the following gentlemen:—

William Hawes, F.G.S., Chairman of Council.

Akroyd, Edward, M.P.
Allsopp, Henry (Burton-on-Trent).
Ashworth, Edmund.
Bartleet, R. S. (Redditch)
Bass, M. A., M.P. (Burton-on-Trent)
Bass, M. T., M.P. (Burton-on-Trent)
Batty, George.
Bazley, Thomas, M.P.
Bessemer, Henry.
Bird, William.
Blackwell, Thomas.
Blaine, D. Roberton.
Brook, Charles (Huddersfield).
Cammell, Chas. (Sheffield)
Campbell, C. Minton (Stoke-on-Trent).
Chambers, Thomas, M.P.
Chappell, Thomas.
Clark, J. (Paisley)
Coats, Thomas (Paisley).
Colman, J.
Copeland, Alderman.
Courtauld, Samuel.
Coxon, T. C.
Creed, Herries.
Dumergue, F.
Elkington, Alfred
Evans, Walter (Derby).
Figgins, Sheriff.
Finnis, Alderman.
Foster, H. R.
Gassiott, J. P., F.R.S.
Graham, Peter.
Hastings, G. W., LL.D.
Henry, Michael
Hunt, John.
Jackson, Robert (Sheffield).
Jackson, Wm. (Sheffield)
James, Edward, Q.C., M.P.
Johnson, J. M.
Kennard, R. W., M.P.
Lawrence, Alderman, M.P.
Lloyd, Sampson (Birmingham).
Mappin, Joseph.
Maudslay, Henry.
The Lord Mayor.
Palmer, George (Reading).
Reed, Charles.
Rimmel, Eugene
Rodgers, J. (Sheffield)
Roebuck, J. A., M.P.
Ryland, Arthur (Birmingham).
Rylands, Jno. (Manchester)
Salomons, Alderman, M.P.
Sandford, Sir Francis.
Silver, S. W.
Simmonds, P. L.
Smith, Edward.
Tapling, Thomas.
Tite, William, M.P.
Underdown, E. M.
Vickers, E. (Sheffield)
Waterlow, Alderman.
Webster, Thos., Q.C., F.R.S.
Welch, J. K.
Wilson, G. F., F.R.S.
Wright, J. S. (Birmingham)
Young, D. H.
Edmund Johnson, *Reporter.*
P. Le Neve Foster, *Secretary.*

With the addition of such Members of the Council as may desire to join it.

The first meeting of the Committee was held on Tuesday, the 13th inst.

Paris Universal Exhibition of 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for without delay.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

Proceedings of the Society.

Musical Education Committee.

The following letter has been addressed to the Dean of each of the Cathedrals:—

Very Reverend Sir,—A Committee of noblemen and gentlemen, of which H.R.H. the Prince of Wales, the President of the Society of Arts, is chairman, has been sitting for some months for the purpose of collecting evidence on the subject of improving generally the musical education of the people of this country.

It has been pointed out to the Committee that free scholarships for study in the Royal Academy of Music, open for competition among youths showing a musical genius, who have been trained in cathedral choirs, &c., might have a useful influence on the choirs themselves, and be calculated to raise the standard of Church music generally.

I have been accordingly directed by the Committee to address you and the Chapter of your cathedral, with a request that you, or the precentor, or any other member of the Chapter interested in Church music, will have the kindness to inform the Committee whether the proposal meets with approval, and if you will oblige the Committee with any suggestions which may be calculated to increase the utility of the Royal Academy of Music to the country at large, and especially to music in churches, it will be esteemed an additional favour.

I have the honour to be,
Very Rev. Sir,
Your obedient, humble servant,
P. LE NEVE FOSTER,
Secretary.

Musical Education Committee.

The Committee met on Wednesday, January 10th, 1866. Present—Henry Cole, Esq., C.B., in the chair, Sir John E. Harington, Bart., Messrs. S. Redgrave, R. K. Bowley, and R. F. Puttick.

Mr. Michael Costa examined by the Committee:—

551. You have been many years in this country, Mr. Costa?—Thirty-five years, I think?

552. I believe you received your musical education at Naples?—Yes, at Naples.

553. That is about thirty-five years ago?—Yes.

554. Can you give the Committee any particulars about the working of the Naples Academy of Music?—The Academy at Naples was founded after that at Paris. Napoleon, when he came to power, instituted many academies, and one was an academy of music. At the time when Murat became King of Naples there were in existence three academies of music, viz., Pietà de Turchini, St. Onofrio, and Loreto, but he very wisely turned all three into one, and ordered it to be called Real Collegio di Musica (Royal Academy of Music), and established it on the same footing as that of Paris, with the difference that there were indoor pupils. The College had three governors, who formed the committee; they were nominated by the King. The Duke of Noja, president, the Chevalier Marinelli, and the Chevalier de Rogati.

555. The directors were not professionals?—No: noblemen appointed to conduct the affairs of the Royal College. Zingarelli was the director, also appointed by the King. He resided in the Academy, had the choice of the masters, and granted certificates to the pupils, on leaving the Academy, according to their merits, without which they could not get appointments. We had two masters for composition, two for thorough bass and organ three for singing, three for solfeggios (aided by the senior pupils, called "maestrini"), two for pianoforte, three for violin, one for viola (tenor), two for violoncello, two for double bass, and one for each wind instrument. We also had two Italian masters, one for arithmetic, one for mathematics, two for the Latin language, one for French, one for history, one for geography, one for declamation, one for dancing, and an actor who prepared the pupils for the stage, and, when operatic performances were given, he superintended the mise-en-scène, &c. We had a rector, a vice-rector, and nine prefects.

556. Were they teachers?—No: they had the charge of the moral discipline of the college, and to watch that the pupils attended to their duties. There was likewise a steward, who made all the contracts for the provisions necessary for the maintenance of the pupils, a secretary, and a keeper of all the instruments. The pupils were divided into four classes called *Camerate*. First class, *Camera de Piccoli*, 13 years of age; second class, *Camera de Mezzani*, 15 years of age; third class, *Camera de Semi-grandi*, 17 years of age; fourth class, *Camera de Grandi*, 19 years of age. The time was thus employed; the pupils got up in the morning at half-past six; at seven, prayers; at half-past seven, breakfast. On Mondays, Wednesdays, and Fridays, from eight to eleven, music masters; Tuesdays. Thursdays, and Saturdays, from eight to eleven, rehearsals with orchestra in the concert-room to try new compositions, by the pupils, and practice the works of great masters, also to read music at sight. Between eleven and twelve, recreation; at twelve, dinner; from two to four, master for literature, etc.; from four to six, recreation; from six to eight, on Mondays, Wednesdays and Fridays, general studies; the same hours on the Tuesdays, Thursdays, and Saturdays, the junior pupils took lessons from the seniors, who prepared them for the next lesson they were to take from the masters; at half-past eight, supper, and half-past nine, to bed. The senior pupils were allowed once a week to go the Theatre St. Carlos to witness and hear the operas performed there. The college had one hundred *piazze franche* (free places), and the same number paid for. When any vacancy occurred in the former, these were filled up by the most meritorious of the paying pupils. We also had female pupils, but they were entirely apart from the college; they only received instruction for the purpose of furnishing organists and teachers in the convents. One of the female pupils was the sister of the famous Lablache, an excellent organist and singer, and was appointed to a Convent in Sessa, near Naples, and subsequently, by her talent and exemplary conduct, became the abbess of it. Attached to the college were the *Scuole Esterne* for outdoor pupils; these were instructed by the *Maestrini* of the college, and, according to their merits, were afterwards received as indoor pupils.

557. Did the outside pupils pay for their education?—None paid. Every six months there was an examination and distribution of prizes. The pupils had six weeks vacation during the latter part of summer. During the year six concerts were given to which the public was admitted by special invitation of the committee.

558. Do you recollect about what was the annual expense of the Naples Academy at the time you are speaking of?—The king granted 36,000 ducats annually, a ducat being equal to five francs; but in that time a ducat

was nearly equal in value to a pound sterling; and when it incurred an extra expenditure to bring out operas, etc., the Government granted the extra money. King Ferdinand the First was very fond of music, and patronised it very much.

559. Did that constitute the total receipts, or were any funds received from other sources?—That was the only fund.

560. There is an academy in Naples still?—Yes.

561. Who succeeded Zingarelli at that academy?—Mercadante; but unfortunately he is blind. The Royal College is not now on the same footing. I know that many things do not go smoothly at present as they ought. Zingarelli, in his high position, was a very energetic and talented director; worked very hard for the interest of the college, and gave his entire personal superintendence to it. He used to go about the rooms when the pupils were taking their lessons, and if he had occasion to find fault with a master, quietly told him, "Please, Signor Maestro, before you leave the college I should be glad to see you."

562. Did he have the appointment of all the masters?—Yes; and also the power of their dismissal; but the latter never occurred in my time.

563. Was his selection subject to the final approval of the committee?—Yes; when a vacancy occurred, he recommended the person of his choice to the committee, who always relied on his judgment; the committee reported to the minister, and the latter to the king, for approval.

564. Can you tell the committee any distinguished pupils of that college besides yourself?—The college, in my time, produced many pupils of great merit. These were:—Manfroci, Mercadante, Conti, Fornasini, F. Marra, Rossi, Bellini, Ricci, Lillo, Lablache, and many others, besides several first-rate professors, but these having always remained in Italy, occupying the first post, are not known out of the Italian kingdom.

565. At the time you were at the academy it was in a flourishing state?—Perfectly so.

566. You have probably some information respecting other academies?—In the year 1834 I went to Paris, Milan, and Bologna. I was much pleased in every respect with the academy in Paris, then in the hands of the celebrated Cherubini. Not pleased much with that in Milan. The Bologna Liceo was the best after Naples.

567. Have you visited the Brussels conservatoire?—No; but after what I have heard and read in the report of Mr. Le Neve Foster, I think it to be equal to that of Milan. What are the results, however? Not very satisfactory. The post of Director in those establishments is only a "Place d'honneur," given to a man considered worthy of honorable retirement. The director receives every three months the report from the masters, and with their concurrence arranges matters as they think convenient. Besides, the director absents himself for a certain time, as well as the masters, and their several duties are performed in their absence by deputies. That system is not only bad, but injurious to the pupils; they take the style from their regular masters, but if these are continually changed the pupils will have no style at all. They give concerts, and mix pupils with professors. How can any one thus form an idea of the progress of the pupils? and the public is admitted by paying for the tickets. This system is entirely wrong. If the admission is by payment, the press has a right to criticise the performance, and criticism in that case does, in my opinion, more harm than good, and for this reason—if a pupil is praised he thinks he has arrived at the top of the tree; if severely judged, he is apt to be discouraged. At the college in Naples the orchestra was composed entirely of the pupils.

568. You think the pupils' concerts should be entirely private?—Yes.

569. What is your opinion with respect to the period of time that pupils should pass in the academy to complete their musical education?—At Naples the pupils were admitted between 12 and 13 years of age, and were generally kept there till 21. They were not permitted to leave the College under seven or eight years' residence.

570. You think an academy can prosper only when the education given is a substantive reality?—Certainly; but without the Government's support it will be useless to think of it. The masters must be well paid, and at a permanent salary. I believe the Royal Academy in London has no master for literature; that is certainly a very great drawback, particularly for composers and singers. I know, and am sorry to say, that some of the finest orchestra players can scarcely write their own names.

571. You are clearly of opinion that if the nation does not think it worth while to give anything towards music, the nation can hardly expect anything good in the way of music?—Just so. It would be a pity if the nation does not respond to the call, because we have the materials to establish the finest academy in the world. The young ladies have, in general, beautiful voices, and there is great talent for many departments, but who encourages them? Nobody.

572. Do you think it possible that sufficient interest could be elicited from the public to support an academy of music without any material support from the Government?—No; it would be a matter of charity not to be relied upon. I consider that music in this country should be placed upon the same footing, encouraged and supported, as it is abroad. On the Continent, music is considered a fine art, and one of the four sister arts—painting, sculpture, poetry, and music; but in England it is not so. Surely musical composition is fine art.

573. You think that England possesses plenty of musical ability, which is now allowed to go to waste?—It is admitted throughout all Europe that the Royal Italian Opera, Covent Garden, possesses the finest band.

574. Of what nation are the performers?—All Englishmen, except nine or ten.

575. Where have they been been educated?—Some at the Academy of Music here, and some received private tuition.

576. It would not be fair to infer that because we have an excellent opera band without such an Academy as we desire, therefore we can do entirely without an Academy of Music?—No; since the year 1837, when our gracious sovereign came to the throne, I had an opportunity of reforming the old opera band, and, with absolute power, I trained it according to my best knowledge and ability.

577. The fact is your band owes its excellence very much to your individual exertions?—To a great extent.

578. Therefore it affords proof of what adequate exertion can do with English materials?—Just so; and I feel confident that if the Government will afford the means to reorganize and place the Royal Academy of Music on a solid basis, it would produce composers, singers, and would supply good players for every theatre in the metropolis and the provinces, with fine orchestras as in France. Go where you like, from the largest to the smallest theatre, you will always find very good players throughout France; but they must be well educated.

579. The public would not have such an opera band unless they paid adequately for it?—Certainly not; if you require the services of a good professor, you must pay him well, not only for his talent, but to afford him also the means to use a good instrument. In Paris they have very good performers, but the instruments are worthless. I believe the violins do not cost more than twenty or twenty-five francs each; as for double basses, they are the worst instruments in the world.

580. I suppose twenty-five guineas would not be an extraordinary price for a good violin?—No; in the Covent Garden orchestra all the instruments are good. I remember at the general rehearsal of "Faust," when M. Gounod heard the pianissimo, so rich and sonorous in the preludio to his opera, he was so enchanted that he said he never heard so rich and sweet a tone in any orchestra before, and that

it went through his heart. The same thing was repeatedly said by Meyerbeer, adding that there was no orchestra in the world that possessed such stringed instruments.

581. You have been good enough to look generally over the proposals laid before the committee by Mr. Cole?—Yes; and I like them very much. I would only make one suggestion. In the proposition No. 7, it is stated, "That the subscribers should pass bye laws for the government of the Academy; that they should elect a board of directors, and have the privilege of admission to the concerts." I do not think the subscribers should have the election of the president, vice-president, and committee.

582. You think they should be named by the Government?—Decidedly.

583. But as it is proposed that a portion of the income should be derived from other sources than the Government, would you not think it advisable that the subscribers should, to some extent, be represented in the councils of the institution?—I would not have them interfere with the internal government of the Academy.

584. You cannot give an opinion how far it would be politic in such an institution?—Let the subscribers have a right to hear the private concerts, and see the progress of the pupils, and have also the privilege of recommending new pupils to the committee.

585. Do you think it advisable to admit any professional element into the business management of the institution?—No; I agree with Mr. Cole in all his other proposals.

586. It has been suggested that it is more politic to attempt to reform the present Academy than to start an opposing institution. Do you agree with that idea?—Yes—certainly.

587. Have you heard that the Academy is under notice to quit its present premises?—No, I have not.

588. It is believed that they cannot stay in their present premises after Midsummer next.—I was not aware of that.

589. Would you recommend that the proceedings of the Academy should be entirely suspended while a new building was being provided for them?—I would not leave the pupils without instruction all that time.

590. You would make the best shift you could in the interim?—I would.

591. And you would prefer temporary accommodation rather than stop the Academy altogether?—Yes.

592. Have you any notion as to about what the cost of the academy would be properly managed?—I can form no idea.

593. You have seen the estimate given by Mr. Cole, viz., £12,000 per annum. Do you consider that sum would be likely to do the work properly?—If you have not in-door pupils.

594. Do you lay much stress on indoor pupils?—No; except to go through the duties more regularly. (Mr. Cole explained the system which is pursued with the art scholars in the school at South Kensington.)

595. Do you think £12,000 a-year would cover the expenses of such a system as that applied to music? I think so, to a limited number of pupils.

Mr. Cole—The pupils being rewarded, according to their excellence, as at South Kensington?

Mr. Costa—You admit a certain number gratis.

Mr. Cole—Yes; and having given proofs of their efficiency, they are paid according to their merits, some pupils receiving as much as 30s. per week for their lodgings and maintenance.

Mr. Costa—It might answer very well, I think; but the number of pupils under that system should be very limited.

Mr. Cole remarked that after ten years experience the system worked extremely well.

Mr. Costa—Of course you make no religious distinction among the pupils?

Mr. Cole—Certainly not. As the best illustration of that I may state that in one week we had an English Bishop, Cardinal Wiseman, and Dr. Adler, making inquiries as to the admission of pupils and aid from the department. As far as the department is concerned it would not have been known whether the pupils were of one creed or the other.

596. What period do you consider the musical training of the pupils should extend?—I should say, as a rule, from five to seven years would be necessary to attain proficiency. If a boy goes in at 13 and leaves at 21, I should say it would be sufficient to complete his education.

597. Mr. Macfarren, in his evidence at the last sitting of the Committee, suggested the desirability of having the Academy placed in connection with a church or chapel, if not of having one included in its own establishment, in which on Sundays full cathedral service should be performed by a choir comprising the whole of the Academy students. Also he thought it of vital importance to preserve the fundamental regulations of the Academy, which require that every student learn harmony, the pianoforte, and sight-singing; that every male student (except singers) learn an orchestral instrument, and, when qualified, take part in the orchestral practice. Do you concur in these suggestions?—I quite concur with Mr. Macfarren's idea of having a chapel attached to the Academy, with a good organ, and a choir formed by the pupils, and I am sure it would be highly beneficial to the students and would prove a great attraction; there you could gratify the subscribers who would support the Academy by admitting them to hear a fine performance of the real good English Church music, which is very abundant, and rarely heard well done. I do not concur with the second suggestion, "That every pupil should play the pianoforte and learn an orchestral instrument." I do not think it right to force a pupil to sing, or play the pianoforte, or other instrument for orchestra performance in the Academy, except that of his avocation, otherwise he will not be perfect in either of them. The Academy of Music must receive pupils who show talent for a certain branch of music, and cultivate the choice of their own inclination: then the result will be satisfactory. If, however, a pupil has inclination to learn more than one instrument let him do so, but never force him.

598. Would you allow pupils to go to sing in the public service of churches?—No; I would not allow the pupils to sing anywhere but in the Academy.

599. With regard to a theatre in connection with the Academy, do you think that advisable?—How can pupils be taught and prepared for the stage without a theatre? The theatre is most essential.

600. Complete with dresses and scenery?—Yes; everything.

601. You have expressed your opinion that music is not regarded in this country so much as a fine art as it ought to be?—Yes.

602. And that offers a serious drawback to music generally. Painting, sculpture, and poetry are differently treated to what musical art is. Do you not think that is a state of things to be deplored?—Undoubtedly so; but if the Government and the nation will take it up it would soon be all right.

603. You have had great experience of English singers—are you of opinion that it is necessary to establish a separate school for English singing, or do you think a general style of teaching, say that which is universally acknowledged to be the best style—the Italian style—is sufficient to train English singers in English singing?—The style must be good in any country, either in England, Italy, France, or Germany; the language only is different. With good masters you have good style, so as to establish a good school, which is required.

604. The opinion of Mr. Macfarren was, that the pupils should be trained by English masters, and they would pronounce English words correctly?—By giving the pupils good masters of elocution and declamation that object is fully attained. The pupils must have their musical education in their own language first, which is the

English, and when they can sing and declaim well, then they should be allowed to sing in foreign languages.

605. Do you think it advisable to admit quite boys as pupils ?—No.

606. Do you think the education of the boys should be left primarily to the cathedral choirs, and after that they might enter the Academy for further tuition ?—First of all, no one can depend on a boy's voice; when it changes it very rarely proves to be a good one. Secondly, the style required in a cathedral is so peculiar that the undoing it is rarely obtained.

607. Do you think it necessary that there should be a musical library of works of reference ?—There should be a first-rate library.

608. Are you aware that the government has accepted the gift of the library, as far as it goes, of the Musical Union ?—I was not aware of it.

[Mr. COLE remarked that such was the fact, and that the same was deposited in the Department of Science and Art.]

609. With regard to the musical director of the academy, do you think that the whole of his time should be devoted to it ?—Certainly, during the time of instruction and practice.

610. And that he should be responsible for its being properly carried out ?—Yes; and he should guide the pupils at the rehearsals. When the pupils are able to compose they should conduct their own music, and the senior student should be the conductor of the academy band; thus you will have a conductor when he leaves the academy. It is impossible to make a colonel at once; he must have his apprenticeship. "Conductor" does not mean simply to beat the time, but he must enter into the feelings and intentions of the composer, and have judgment and tact to guide the whole body under his command.

611. You do not agree in the opinion that has been expressed, that the director of the academy should be a layman ?—I do not. How can a layman direct, inspect, find faults, and correct what he does not understand ? It would be almost the same thing to appoint a musician president of the Royal Academy and the National Gallery. The director of the Royal Academy of Music must be a most sound musician, an independent gentleman, and not influenced by prejudices or jealousies.

612. You think the principal of an academy should not teach himself, but only superintend the teaching ?—Yes.

613. And that no part of his salary should be derived from teaching ?—None at all. He should reside in the Academy, and have, as far as music is concerned, the entire control of it.

CANTOR LECTURES.

"ON SUBMARINE TELEGRAPHY." BY FLEEMING JENKIN, ESQ., C.E., F.R.S.

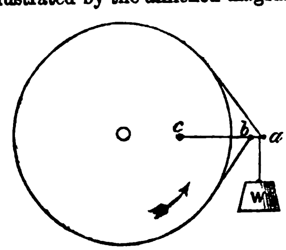
LECTURE III.—MONDAY, FEBRUARY 12.

LAYING AND REPAIRING CABLES.

The lecturer mentioned that he had received a letter from Messrs. Wells and Hall, stating that some lengths of their india-rubber cables had been at work for some time under water. This was not doubted, but did not affect the original statement, that much india-rubber had decayed, whereas no gutta-percha under water had decayed. Mr. Hooper had also misunderstood the statement in the abstract that pure india-rubber yielded to continued pressure; this was not meant to apply to Mr. Hooper's material, which is always more or less vulcanized. Attention was also drawn to a map of the telegraph lines between Europe and the East, prepared by Messrs. Bright and Clark, and kindly lent by them. The following is an abstract of the lecture arranged under the heads of the syllabus:—

1. *Stowage on board ship.*—The cable is coiled into large circular, or nearly circular, coils, so as to uncoil without receiving a twist, as shown on the last occasion. The coils are now held in iron water-tight tanks, and remain constantly under water. Tanks were first made for the Red Sea cable, but first used for the Malta-Alexandria cable. The tanks in the *Great Eastern* were three in number, from 51ft. 6in. to 58ft. 6in. diameter, and 20ft. 6in. deep. To prevent rolling, their centre of gravity should be only slightly below the water line. If the water be withdrawn from the tanks before the cable is paid out, the wires rust, and the chemical action heats them injuriously; with galvanized wires or cables covered with Bright and Clark's composition this heating does not occur. The eye of the coil round which the cable lies, generally from 6 to 8 feet in diameter, is filled with a cylinder, to prevent the bight of the cable from falling down, and possibly forming a kink or loop. Mr. Newall uses a cone permanently fixed in the centre of the coil. Messrs. Glass and Elliott lower their solid eye as the uncoiling proceeds. The cone appears to the lecturer to afford the best guarantee against kinking. It was used in the Persian Gulf expedition. When running out at high speeds the cable, if unchecked, would fly out, urged by centrifugal force, so as to be dangerous and unmanageable. This tendency is controlled by rings, lowered as the tanks are emptied, and first forcing the cable to run horizontally towards the centre and then controlling its upward motion. These rings were first used by Messrs. Newall and Co.

2. *Break.*—From the tanks the cable is laid in troughs to the break, by which a restraining force is applied to prevent too rapid egress. The troughs in the *Great Eastern*, from the fore-hold to the break, measured 450 feet. The cable is wound four or five times round a drum, 6 or 8 feet in diameter, and the rotation of this drum is controlled by friction. The turns round the drum hold the cable securely, and prevent its egress unless the drum itself turns. The riding of the cable is prevented by a simple contrivance, known as a knife or plough, which was exhibited on a model. On the *Great Eastern* this knife or plough could be adjusted. The simplest manner of applying retarding friction to the break is to hang a weight on to a break strap, the other end of which is fixed. If the weight is hung from that end of the strap which would be lifted by the friction of the drum as it revolves, the retarding force can never exceed the weight, and a limit may be thus placed to the strain on the cable. But it was found in practice that with a strap making less than one turn round the drum, a weight of, say four tons, had to be applied to give a friction of one ton; the limit due to the position of the weight was, in such a case, of small value, since any heating of the strap or dirt on its surface might rapidly increase the strain fourfold. Mr. Appold's break remedies this defect. The principle on which it is constructed is illustrated by the annexed diagram. The end



of the strap a, on which the greatest strain comes, is attached to a lever, hinged at c. Between the centre of the drum and a, the other end is attached to the lever very near a; but between a and c the retarding friction is obviously equal to the difference of the strains on the end a and b of the break strap, and the weight w is almost exactly equal to that difference. This relation does not depend on the co-efficient of friction between the strap and the drum; if the friction increases, the weight w is raised a little, and the lever $a\,c$, owing to the eccentrical position of c, slightly lengthens the

break strap, reducing the friction. The opposite effect occurs if the co-efficient of friction diminishes. The motion of $c\,a$, required to tighten or loosen the break strap, is almost infinitely small, so that the angles of the break strap and lever and the relations of the strains do not sensibly vary. This arrangement was used on the *Great Eastern*. It worked admirably, and gives a perfect safeguard against the application of any unforeseen strain by the friction of the break strap. Strains may, however, occur from other causes, and for their detection a dynamometer is used between the break and the stern. The cable is passed under a weighted pulley, at a somewhat obtuse angle. The weight thus hanging on the cable is raised higher and higher as the strain on the cable increases. A scale is constructed by experiment showing the height corresponding to each strain. By this simple contrivance the actual strain on the cable can be observed at any moment. The following is a convenient formula for calculating the relation between the strains on break straps and the friction produced. Let Q be the strain on that end of the strap which holds back the wheel, P the strain on the other end, f co-efficient of friction, and b the angle embraced by the strap in circular measurement (unit$=57{\cdot}296°$).

Then; $Q = e^{fb}\,P$, where $e = 2{\cdot}71828$.

f may be taken for	leather on iron	$= 0{\cdot}35$
,, ,,	iron on iron, wet	$= 0{\cdot}15$
,, ,,	wood on iron, wet, less than $0{\cdot}1$	

3. *Theory of Submersion.*—In October, 1857, Professor William Thomson published in the *Engineer* a short sketch of the true mathematical theory of the form assumed by a cable while sinking, and the strains to which it is subjected under various conditions. The consequences of this theory were much more elaborately worked out (independently of Professor Thomson's publication, the lecturer believes) by Messrs. Brook and Longridge, in a paper read before the Institution of Civil Engineers, in the spring of 1858. Much of what follows is taken from that paper. If the ship and cable are both at rest in still water, the latter hangs in a catenary curve, the strains on which are known and easily computed. This case actually occurs whenever a ship stops paying out cable, for instance, to cut out a fault; if the cable were suddenly stopped so as to lie at a great angle with the vertical line, a strain would be produced so great as infallibly to break the cable; thus for a catenary in which the cable at the point of suspension lies at an angle of 9° 30 with the horizon, the strain at the point of suspension is equal to 72½ times the weight of the cable hanging to the same depth vertically; so that in 2,000 fathoms the strain would be equal to the weight of 145 miles of cable; but the Atlantic cable would break as soon as the strain exceeded the weight of 11 miles. From this it will be seen that a cable cannot be immediately stopped whilst being payed out, but must be gradually checked while the ship is backed, so as to keep the cable where entering the water as nearly vertical as possible. Another conclusion which follows is, that the cable while being paid out cannot possibly be hanging in a catenary curve, since the Atlantic cable did lie at an angle of about 9°30′, and the strain, instead of being 2,030 cwt., was only about 12 cwt. The following consideration may help us to perceive how different the case of a body sinking regularly is from the case of a chain at rest. Suppose the ship to drop a number of spheres of the specific gravity of the cable into the water at regular intervals; each of these would, within about two feet of the surface, acquire a definite, sensibly constant velocity $v = \sqrt{\frac{w}{q}}$ where w = the weight, and q the resistance to the body moving at one foot per second; these spheres, moving with constant velocity at constant intervals of time, would lie in a straight line from the surface to the bottom, and would be more or less inclined to the horizon as the speed [of] the ship was less or greater. If the spheres w[ere] joined by an infinitely thin string, to which [the] water offered no resistance, they would form [a] cable which could be laid without any tension whatev[er] and with an amount of slack or waste depending sim[ply] on the inclination of the line to the horizon. T[he] practical case of a submarine cable lies between th[e] two extremes of the catenary and the isolated spher[es;] each short length of the cable lies like an inclined rod [in] the water, and has, therefore, a tendency to shoot back [in] a given direction, whereas the isolated spheres tend [to] fall vertically. Owing to this, cables, or, at least, hea[vy] cables, cannot be laid without tension except at the [ex]pense of an enormous waste of cable. It will be [un]necessary here to repeat the whole mathemati[cal] investigation which is given in Messrs. Brook [and] Longridge's paper. It will be sufficient to give [the] results arrived at. Mathematical readers will read[ily] understand that these results are calculable from [the] data given:—

v = the velocity of the paying-out vessel in feet per seco[nd].
v_1 = the velocity of the cable paid out in feet per seco[nd].
w = the weight of one foot length of the cable in lbs
ϕ = the angle which the cable at the surface makes w[ith] a horizontal line.
x = the height of any point A from the bottom of the s[ea].
q = the resistance in lbs. which the water opposes to [the] motion of each foot of the cable moving perpendicula[rly] to itself, at the speed of one foot per second; q may [be] called the co-efficient of resistance to displacement.
q_1 = the resistance in lbs. which the water opposes to [the] motion of each foot of the cable drawn through [it] lengthways, at the speed of one foot per second; [q_1] may be called the co-efficient of friction.
m = the resistance in lbs. which the water opposes [to] the motion of each foot of the cable moving perp[en]dicularly to itself, at speed of v feet per second; [m] assumed $= qv^2$.
m_1 = the resistance in lbs. which the water opposes [to] the motion of each foot of the cable drawn thr[ough] it lengthwise at the speed v. m_1 is assumed $= q_1$[...]
t = tension in lbs. at point A, which in what follo[ws] will be assumed as at the surface where the ma[xi]mum strain occurs.

Then if the cable be laid without any tension at [the] bottom, which is now invariably done, the equation [of] the curve assumed by the cable will become the equatio[n] to a straight line inclined at an angle to the horiz[on] such that

$$(1.)\quad \text{Cos. } \phi = \frac{\sqrt{w^2 + 4m^2} - w}{2m}$$

Or, what amounts to the same,

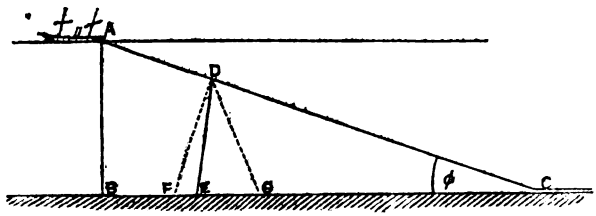
$$(2.)\quad \frac{\text{Cos. } \phi}{\text{Sin.}^2\, \phi} = \frac{qv^2}{w.}$$

From this it appears that the angle at which any gi[ven] cable will be paid out is (when not tight at bottom), [in]dependent of the tension t (or of the velocity v_1), [and] is dependent simply on the velocity v of the ship. Ca[bles] which are bulky for their weight, or, in other words, of light specific gravity, lie at a small angle, but [by] increasing the ship's speed any cable may be paid [out] at a small angle. We find further, when no slack [is] paid out,

$$(3.)\quad t = \left(w - m^1\frac{(1 - \cos\phi)^2}{\text{Sin.}\,\phi}\right)x$$

$w\,x$ is simply the weight of a length of the cable hang[ing] plumb from the ship to the bottom. This is the maxim[um] tension that can be required to lay any cable with [no] slack. This tension is always slightly diminished [by] a certain small portion of its amount constant, fo[r]

given speed and cable. The annexed diagram may help to explain the results arrived at. The cable A C, lying on an inclined plane of water at the angle ϕ, is carried by a tension equal to the weight of a length A B of cable, somewhat as a chain would be in equilibrium lying on a frictionless inclined plane A C, and



hanging down over a pulley at A to the depth B; but the inclined plane of water is not at rest; it yields under the cable at every instant at every spot; if the cable were pressed through the water in a direction perpendicular to itself, so that the plane of water yielded before the pressure of the cable, and did not slip along it at all, the above analogy would be perfect, and the tension at A would be simply equal to $w\,x$; but since we have supposed the cable to be laid without tension, and without slack at the bottom, any point D must finally come to a point E, such that E C = D C; and it will be easily seen that the point D to do this must move in a straight line E D. Now this line D E is not perpendicular to A C; it falls within that perpendicular D F, so that if we suppose the plane of water under A C to yield perpendicularly before it, we must also conceive the cable as slipping back a little on the plane by an amount corresponding to the space between D F and D E, but this slip is opposed by the friction of the water, which thus tends to prevent the cable from running back on the inclined plane, and so relieves the tension by a small amount. This amount is so small that it may be practically neglected, and would not have been mentioned did not the same considerations enable us to understand the effect of laying cable with a certain amount of slack. When this is done a point, D, moves in a line, say D G, differing much more in direction from D F than D E does. When much slack is laid, the cable slips back at a considerable velocity on the inclined plane, and meets with a frictional resistance tending considerably to relieve the tension. Thus, when the cable is paid out at a velocity v_1, we have

$$(4.)\quad t = \left[w - m^1 \, \frac{\left(\frac{v^1}{v} - \cos.\ \phi\right)^2}{\sin.\ \phi} \right] x$$

When v_1 is considerably in excess of v, the fraction of the whole tension which the friction m^1 subtracts from $w\,x$ is very considerable. It also increases rapidly as the speed of the ship increases, and it further increases if the specific gravity of the cable be small, for then it lies at great length in the water, presenting an immense surface to be gripped by the water. The friction on each foot is but small, but when twelve or thirteen miles of cable lie in the water, presenting a surface of 70,000 or 80,000 square feet, the result is practically very important. Assuming a mean speed of 10·4 feet per second as that at which the Atlantic cable was paid out when lying at an angle of 9° 30′ in 2,000 fathoms of water, with a tension of 12 cwt., we obtain the following values for the constants:—

$$\left.\begin{array}{l} q = 0{\cdot}085 = 0{\cdot}81\ D \\ q_1 = 0{\cdot}0085 = 0{\cdot}081\ D \end{array}\right\} \text{ where D = diameter of cable in feet.}$$

From some observations it would seem as if the angle had been even less than the above, in which case q would be larger and q_1 smaller. From Beaufoy's experiments we should have expected q to be more nearly 0·65 D; but the roughness of the cable may account for the difference, as it certainly does for the great difference in the co-efficient of friction, which is nearly eight times that which a smooth surface would present. It is probable that for a smooth iron cable the value of q_1 would be more nearly equal to 0·001 D, and $q = 0{\cdot}065$ D. One reason will now be plain for giving in the foregoing tables the strength of the various cables relatively to the depth in which they are to be laid. The strain required to lay them is always a fraction of that depth, but the strain will not be always the same fraction of the depth, but will be smaller for the lighter cables when laid slack.

4. *Application of Theory.*—The practical results of equation (4) are most important. To lay any cable, however light, quite taut, we require nearly the tension due to a weight of the cable hanging plumb from the surface to the bottom; but by increasing the bulk of any cable, though we do not diminish its actual weight, we may, by laying a little slack, diminish the tension very greatly. With such a cable as the second Atlantic the tension was thus diminished more than half; to lay it taut would have required nearly 28 cwt., and 12 cwt. was the amount actually required when about 15 per cent. slack was paid out. The strain could be maintained constant in all depths, by allowing a little more slack to run out in deep water, and even this could be prevented by a slight increase in the speed of the ship. No relief at all comparable to the above, is obtained by paying out heavy cables slack; but on the other hand, still lighter cables can be paid out under still more favourable conditions. The ratan and hemp cable (No. 11, Appendix 1) would, with 12 per cent. slack, be paid out without any strain at all, and if more slack than this were desired the cable would have to be pushed out of the ship. Nearly the same might be said of a bare gutta-percha wire. The Atlantic cable, in the last expedition, was laid in depths varying from 1,750 to 2,000 fathoms, at speeds for the ship varying from 4¼ to 6¾ knots per hour, while the cable ran out at from 5 to nearly 8 knots per hour. The angle, according to one method of observation, varied from 9° to nearly 12°, but was somewhat less according to other observations; 9° 30′ seems to have been a usual angle. The slack paid out in deep water ranged from 9 per cent. to about 18½ per cent. On the last day the slack was about 14·8 per cent. The strain on the cable was very constant, ranging from 10 cwt. to 14 cwt., and generally being between 11 cwt. and 13 cwt.; the pitching of the ship never caused more than about 2 cwt. difference in the strain; but once, when going slow to change holds, the strain was 17 cwt.; this accords with theory. The lecturer has to thank the engineers of the Telegraph Construction and Maintenance Company for the above information.

5. *Proposed Improvements.*—Reels have been proposed in ships as a substitute for the coils in tanks. Their great mass in motion would be difficult to control. Mr. Siemens actually tried with some success a reel for a light cable and drove it with an engine; he abandoned the plan for the old system; the defects which the reel is supposed to remedy

do not exist; Captain Selwyn has proposed to use a reel floating in the sea, ingeniously retarded by paddles, which would prevent too much slack from being laid; it hardly becomes a landsman to tell a sailor that such a reel would be unmanageable; but the difficulties of coiling in water, of launching the reel if coiled on land, of protecting the surface of the cable against collisions, of testing the cable, of remedying any defect, should any arise, and even of preventing one coil from cutting into those immediately below it seem unavoidable, and the defects the invention is supposed to remedy are imaginary. Buoys have been proposed to relieve the cable from part of its weight; any hollow buoys would be crushed very shortly after leaving the surface. Mere wooden floats would do little, and be difficult of attachment. This invention also labours under the disadvantage of being unnecessary, since cables can be paid out with 12 cwt. strain or less, which will bear 150 cwt. Vanes on a cable, opposing its slipping backwards, would be correct in principle, although probably quite impracticable; the result aimed at is obtained by increasing and roughening the surface of the cable. Most engineers who have had practical experience deprecate any attempt to catch the cable by nippers after it has left the ship. The danger of fouling is more considerable than the extra chance of safety given by the nipper. Lastly, many proposals have been made for some kind of elastic arrangement, to compensate for the change of strain caused by the rise and fall of the ship. When cables are paid out so nearly horizontally as is now the case, these arrangements, even if practicable, are not required, the alteration of the strain, caused by the motion of the ship, is quite inconsiderable, and there is great difficulty in devising any elastic arrangement which by the inertia or momentum of its parts would not aggravate the evil, such as it is. Unless when going very slow, in very bad weather, the best conceivable elastic arrangement would be useless if not injurious.

6. *Repairs in shallow water.*—So long as the outer wires of a cable remain sound, repairs in shallow water are always easily effected. The cable is caught by a grapnel, lifted to the surface, cut, tested, and if the fault be near at hand, one end of the cable is buoyed, the other end passed round a drum driven by a steam engine, which gradually hauls in the cable till the fault is found, when it is repaired, the cable again paid out, and spliced at the part buoyed. Bad weather and a rocky bottom are the chief difficulties to be contended with. Sometimes the cable is not cut or hauled on board, but simply underrun, passing over a grapnel or sheave hung outside the bows of the ship; as the ship moves forward the cable rises in front and is again lowered behind the ship. There are many points of practical interest connected with repairs in shallow water, and the lecturer refers those who require further details to Mr. F. C. Webb's paper in the *Transactions of the Institution of Civil Engineers*, 1857-58. If the bottom be good, *i. e.*, sandy or muddy, cables can always be recovered within 100 fathoms, and they are frequently hauled up in much greater depths.

7. *Repairs in deep seas.*—The only method hitherto practised with success has been to commence in shallow water and gradually haul the cable on board as described above. By carefully keeping the cable hanging vertically from the bows the strain on it will not greatly exceed in calm weather the weight of the cable hanging plumb from the ship. Cables have been recovered in this way out of depths of 1,000 and 1,500 fathoms at the rate of about a mile per hour. Messrs. Newall were very successful in the Mediterranean in recovering many cables by this plan, and the lecturer has seen a cable hang for three days at the bows of a ship where the depth was 800 fathoms, while the ship pitched violently owing to bad weather; the cable did not break, and was relaid with success. Even in this case the rise and fall of the ship did not injure the cable, but the change in the strain on the cable was great, and any good elastic compensation would have been useful; the cable itself, yielding say $\frac{1}{2}$ per cent. in a mile, gives a certain elasticity. Although this method of recovering deep sea cables is not hopeless, the risks are great; bad weather or a weak point in the cable entail almost certain failure. A good nipper to catch the cable, should it break in board, as it frequently does, might be of material service. Few persons will be sanguine enough to expect that a cable could be steadily picked up for 1,000 consecutive hours, or say forty days, with about half its theoretical breaking strain necessarily always upon it. We should, therefore, be grateful to the engineers in charge of the late Atlantic expedition for showing us that even in 2,000 fathoms of water the attempt to hook a cable with a grapnel is far from hopeless. The chance of success by this method will now be examined. If a cable were laid absolutely taut along the bottom of the sea, when hooked by the grapnel it would rise a little way in virtue of its elasticity; if it stretched one per cent., by the time ten miles of it were off the ground the apex would be half a mile from the ground; a result few are prepared to expect, but the strain on the cable where caught would be very great, equal to the weight of about 24 miles of the cable, though the weight on the grapnel rope would be only that of ten miles of cable. The result, therefore, of trying to raise a cable such as the Atlantic laid taut, would certainly be to break it; but cables are not laid taut in deep water, and the Atlantic is laid with a mean slack of about 12 per cent., and in the last days we may even count on 14 or 15 per cent. slack, that is to say, for every 100 miles passed over, 114 or 115 miles of cable were laid. Lay on the floor 114 inches of chain, between two points 100 inches apart, lift it in the middle on a hook, the two ends will hang down in catenary curves, and when the cable at the extremities is just off the floor, the hook will be 23·3 inches from the floor. Quite similarly a cable laid with 14 per cent. slack will, when caught by the grapnel, hang in two half catenary curves, and by the time 11·4 miles of the cable are off the ground, the grapnel will be 2,330 fathoms from the bottom, *i.e.*, at the surface of the Atlantic. The strain on the grapnel rope will be the weight of the cable lifted, or about 11·4 miles; the strain on the cable itself at the point of suspension will be much less, being only about $3\frac{1}{2}$ times the weight of the cable hanging vertically, or say 8 miles of cable. (Observe that the strain on the cable and the weight of the cable are not synonymous. When the two ends hang plumb, the strain on the cable at top is half the weight of the cable carried. When there is little slack, the strain is much greater than the weight carried.) If the depth were only 2,000 fathoms, the strain on the cable when brought to the surface would only be equal to the weight of about 7 miles of cable. Moreover, the actual cable is not held at any point except by its own weight, and there will be a pull at the bottom tending to haul in slack towards the grapnel amounting to several tons: but even without counting upon slack obtained in this way, it is clear that if the cable will bear 11 miles of its own weight, it could, under favourable circumstances, be hauled to the surface by a single grapnel.

Tables VII. and VIII. give the proportions and strains on catenaries in various convenient practical forms. Thus, from Table VII. we see that if ten per cent. slack be laid, the maximum tension on the catenary lifted in, say one mile, will be the weight of 4·52 miles of cable. In two miles depth the strain would be the weight of 9·4 miles of cable. In the latter case, $2 \times 5{\cdot}67 = 11{\cdot}34$ miles of cable will be off the ground, and the grapnel rope must be strong enough to bear this. Table VIII. gives similar information, supposing we do not start from a definite per-centage of slack, but know the proportion of the dip made by a rope to the strain. But although from these tables it appears that the Atlantic cable might be lifted by sheer pulling, this course is not advisable owing to the extra strains produced by the heave of the ship, the resistance

TABLE VII.

Giving length of cable lifted with a given slack, and hanging in a catenary curve, &c.

Slack in per-centage.	Tension at highest point in terms of the weight of a length of cable hanging vertically from the surface to the bottom.	Length of curve in terms of versine.	Length of versine of span 100.
0	infinite	infinite	0
1	47·6	19·42	5·2
2	20·8	12·75	8·0
3	13·5	10·20	10·1
4	10·0	8·74	11·9
5	8·18	7·84	13·4
6	6·90	7·16	14·8
7	6·01	6·64	16·1
8	5·39	6·24	17·3
9	4·88	5·92	18·4
10	4·52	5·67	19·4
11	4·18	5·43	20·45
12	3·89	5·21	21·5
14	3·49	4·89	23·3
16	3·12	4·58	25·3
18	2·89	4·37	27·0
20	2·67	4·17	28·8
22	2·48	3·98	30·6
24	2·39	3·89	31·9

TABLE VIII.

Showing the length of a catenary curve of constant span = 100, with various deflections at the centre, and giving strains at highest point in terms of the unit length of chain.

Proportion of versine to span.	Length of versine or dip.	Length of curve.	Strain at highest point in terms of the unit length of chain.
0	0·00	100·0	infinite
$\frac{1}{12}$	8·33	102·1	160·9
$\frac{1}{11}$	9·09	102·6	149·3
$\frac{1}{10}$	10·00	103·0	137·6
$\frac{1}{9}$	11·11	103·4	125·8
$\frac{1}{8}$	12·50	104·3	115·2
$\frac{1}{7}$	14·29	105·4	104·3
$\frac{2}{13}$	15·38	106·4	99·7
$\frac{1}{6}$	16·67	107·3	94·5
$\frac{2}{11}$	18·18	108·9	90·5
$\frac{1}{5}$	20·00	110·4	86·2
$\frac{2}{9}$	22·22	112·4	82·1
$\frac{1}{4}$	25·00	115·4	79·1
$\frac{1}{3}$	33·33	125·4	75·6
$\frac{1}{2}$	50·00	177·3	103·5

to displacement by the water, the friction of the water, possible currents of water, the possible drift of the ship to one side of the cable, and the possible existence of a weak point in the cable. Owing to all these elements the practical chances of success by sheer pulling are very small. It has been proposed to lift the cable by a number of ships, acting like so many piers to a suspension-bridge. It is difficult to suppose that they would keep their respective positions accurately, or all haul in at the proper rate. It has also been proposed to catch the cable at one point, then at another nearer the end, then to drop the first grapnel, and catch the cable again nearer the end, and so, working hand over hand, reach a point at last so near the end that the cable could be lifted nearly vertically. This is better than the last plan, but is unnecessarily complicated, and the cable might easily be injured in the attempts to catch it at so many points. The simple plan which at once occurred to all practical men, is to catch the cable with one ship by a holding grapnel, and then to cut it with a grapnel from a second ship, some three miles to seaward; the loose end held by the first ship could then be hauled on board with little strain. This plan will probably be adopted, with much chance of success. It is certain the cable *was* caught, and probably it can be hooked again; if so, there should be no difficulty in raising it, unless it is rusted to a much greater extent than we have any reason to expect. The grapnel of the first ship should be a holding grapnel, of which several models were shown, otherwise the loose end might fly back over it if the second ship cut too near the first. The second ship should have a cutting grapnel, of which models were also shown, lest if the attempt were made to break the cable by brute force it might break at an inconvenient point. Mr. Latimer Clark's grapnel, which would answer either of these purposes, was exhibited. The cable when hooked releases a catch, allowing a block, to which the grapnel rope is attached, to be hauled up the shank, pulling round two right and left hand screws by two steel bands; the screws close the jaws, which grip the cable or cut it; or one grapnel may be made both to cut and grip the cable. The grapnel can lie in only two positions, and if dragged in the proper direction, cutters placed at two diagonally opposed corners would cut the cable certainly to seaward, and the jaws hold the landward end. A simple form of holding grapnel, conceived by Mr. Carpmael, jun., was shown; in this the cable is jammed between the prongs and a kind of half bollard. A holdfast or cutting grapnel, designed by the lecturer, was also shown. Each prong is hinged on a pin projecting beyond the shank, and the prong is so shaped at the root that the cable when on it closes the prong tighter and tighter on itself, whereas the end of the prong when dragging through sand or mud is opened like a Trotman's anchor.

ELEVENTH ORDINARY MEETING.

Wednesday, February 14th, 1866; J. W, Bazalgette, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Brock, James, 21, George-street, Portman-square, W.
Fretwell, John, 24, Mark-lane, E.C., and 8, Upper Homerton, N.E.
Howard, Raymond, 29, King-square, Goswell-street, E.C.
Patry, James, 7, Cambridge-terrace, Regent's-park, N.W.
Rutson, John, Newby Wiske, Thirsk, Yorkshire.
Salt, Titus, Jun., Saltaire, near Leeds.
Shoolbred, Frederick, 51*a*, Portland-place, W.
Turner, Cornelius, St. James's-road, Old Kent-road, S.E.
Wickham, William, 33, Tavistock-street, Covent-garden, W.C.

The following candidates were balloted for, and duly elected members of the Society:—

Ashworth, George Leach, Roche Mount, Rochdale.
Barry, John Boyle, 16, St. Peter's-terrace, Notting-hill, W.
Blackburn, George, 32, Fore-street, City, E.C.
Brooks, William Elliot, 14, Gt. Queen-street, Lincoln's-inn-fields, W.C.
Butler, William, St. Helen's, Lancashire.
Ella, John, 18, Hanover-square, W.
Fase, Berkeley W., 22, Oxford-street, W.
Gushlow, George, 60, Newman-street, Oxford-street, W.
Homfray, H. R., The Place, Stradishall, near Newmarket.
Jonas, John, 150, Leadenhall-street, E.C.
King, John, The Rushetts, Thames Ditton, S.W.
Macintosh, John, Craven-street Chambers, Strand, W.C.

Myers, Abraham, 171, New Bond-street, W.
Nicol, Robert, Westminster Palace Hotel, S.W.
Phillips, Charles Palmore, 109, Fenchurch-street, E.C.
Pullar, Wm. Black, Perth.
Ross, J. C., Ravenglass, Cumberland.
Sim, William Fisher, Rose Bank, Peckham Rye, S.E.
Storr, John S., 26, King-street, Covent-garden, W.C.
Terry, Charles, Newport Pagnell.
Trevelyan, George, M.P., 8, Grosvenor-crescent, S.W.
Vansittart, Miss, Reading.
Walker, William, 1, Stock Orchard-villas, Holloway, N.
Wall, Prosper, 6, Fortess-terrace, Kentish-town, N.W.
Webster, George, Melbourne (care of Messrs. Hopcraft and Broadwater, 3, Billiter-square, E.C.)
Woodford, John Wm. Gordon, 12, Park-st., Grosvenor-square, W.

The Paper read was—

ON THE GAS SUPPLY OF PARIS.

By George R. Burnell, Esq., C.E., F.G.S.

Amongst the wonderful adaptations of physical science to the daily usages of life, there is hardly one which is calculated to excite greater attention than the application of carburetted hydrogen gas to the purposes of illumination. It is essentially a discovery of modern times; for there must be many here present who can recollect the "darkness visible" that enshrouded London streets in the days when oil lamps were in vogue; but we get so soon accustomed to the enjoyment of luxuries, that very often the first steps that attend their acquisition are forgotten, and we take them as matters of course. Somewhat of this kind of reasoning has been adopted with respect to the use of gas; and the public are inclined to expect that the manufacturers of this article, which has now become almost a necessity of life, should give them the benefit of their experience, without taking into account the cost they must have incurred in acquiring it. The discussions that took place on the occasion of granting the new concession for lighting the city of Paris, and the movement that is at present going on in our own metropolis, seem to have been marked with this spirit; and though the Paris Gas Company has succeeded in obtaining what may be considered as favourable terms in return for the supply of gas, yet the inhabitants of London evidently are disposed to expect that the companies should supply them at such prices as would hardly leave them a fair profit. It therefore struck me that a statement of the conditions under which the Gas Company of Paris have contracted to supply the town with that article of consumption might be of interest, if only to enable the engineer to compare the systems adopted in the two countries with respect to public works; the more especially as it would appear that considerable misapprehension exists with respect to the rights and privileges of our neighbours in this particular matter. It is proposed also, in the course of this paper, to notice the points wherein the manufacture and distribution of gas in Paris differ from those which are followed in London.

The formation of the one gigantic monopoly that has the privilege of lighting Paris took place in this manner. There had been several companies, that were formed for the supply of the city, which had, from the period of their first establishment, enjoyed a species of districting arrangement, as we should call it, and they agreed to merge their separate capitals in the six companies that had treated with the municipality in the month of December, 1846. In the year 1852, when the empire was first established, the Government thought it to be its interest to encourage the formation of great companies who should possess the means of employing large numbers of workmen, and give rise to the profitable investment of capital. The hygienic effect of the establishments for the manufacture of gas in the interior of the city also weighed with the Government; and they were desirous that at least three or four of these should be removed from their original positions in the centre of the town. Under these circumstances it was suggested to the shareholders of the six companies that their union would be received with pleasure; and then that their application for the prolongation of their concession, which expired at the close of 1863, might be entertained upon conditions that were to be the subject of future deliberation. The consequence of this proceeding on the part of the Government may be described, in substance, to have been that the concession for lighting Paris was granted to the united companies on these terms. The three establishments in the interior of Paris, at the Avenue Trudaine, the Rue du Faubourg Poissonière, and the Rue de la Tour du Temple, were to be suppressed, and their manufacture was in future to be conducted in the new gas station that was to be erected at La Villette. The canalization of the interior of Paris (understanding by that term the lines of mains and distributing pipes) were to be altered, and made so as to correspond with the probable future demand upon them; the company agreed to pay the town the sum of £8,000 for the privilege of laying their pipes in the public ways; also it agreed to pay the town two centimes a mètre cube, or about 5½d. per 1,000 cubic feet, as a compensation for the *octroi* dues; it moreover agreed to share the profits of the working above 10 per cent. with the municipality of the city of Paris after the expiration of the first sixteen years.

The material and plant that were employed, and all the land and buildings devoted to the manufacture, were to remain the property of the company at the expiration of the lease, which was fixed at 50 years from the 1st of January, 1856, and the company bound itself, in the meantime, to alter the position of their mains, &c., whenever the town might require to execute works for the water supply, sewerage, &c.; so far, indeed, has the lease foreseen the probability of future operations of this nature, that it provides for the company's removing their pipes into any subways that the town may construct, without thereby giving rise to any claim for compensation. For these terms the company agrees to supply gas for the public lighting at the following prices:—There are three sets of flames, that are respectively 2¼ inches wide by 1⅛ inches high, which is paid per hour, 0·015f.; 2⅝ inches wide by 1¼ inches high, which is paid per hour, 0·021f.; and 3$\frac{1}{16}$ inches wide by 1$\frac{5}{16}$ inches high, which is paid per hour, 0·030f. When the gas is sold to the town by metre, it is paid for at the rate of 0·15f. the metre cube, or about 3s. 4½d. per 1,000 cubic feet; the company is obliged to fix, paint, and repair the lamp posts and candelabra, but the town furnishes them. For private consumption, the company was entitled to charge for the gas supplied at the rate of 0·30f. per metre cube, or about 6s. 8½d. the 1,000 cubic feet, upon agreement of three months' date, terminable at the option of either party; but the parties so receiving the gas cannot employ it without the production of the certificate of the person employed by the town to examine (and who exercises the right of approving) the fittings and other apparatus. The company is at liberty to modify the terms of payment, in this sense, that it is allowed to receive the payment in monthly sums, but this must be on the condition of its being paid in advance. No subscription whatever can be refused by the company, provided the demand be drawn up in accordance with the model that is approved by the municipality. The company is at liberty also to charge at so much per hour, or by the metre. A model of each set or series of metres is deposited at the town hall, and every metre must correspond with the details of these; they are bound to be verified as often as the administration may require. All expenses attending these metres are at the cost of the consumer, whether in the first place or in the subsequent maintenance of them; practically, they all come from the stores of the gas company. It is to be observed that the gas company is not bound to deliver gas to the private consumer at other periods than

those in which the mains would be under charge for town lighting. It was moreover stipulated that if during the period of fifty years, for which this lease was granted, there should be discovered any new system of lighting, the gas company should be bound to introduce it, under conditions that were to be fixed by the municipality; or the municipality reserved to itself the right of granting a fresh concession for the new system of lighting, without being bound to compensate the company in any way whatever. There are in the lease various provisions as to the amount of coal, &c., that the company is obliged to hold in stock, and as to the payment of the mains, valves, cocks, syphons, &c., that are placed in the public ways; these are estimated, in block, to be worth the sum of two million of francs, or £80,000, which sum would have to be paid to the company, in case of the town taking the concession into their own hands, or at the expiration of the concession. The quality of the gas is provided to be such, that a lamp of the first series mentioned, which would consume 100 litres per hour, should give a light equal to 0·77 of a carcel lamp burning 42 grammes of rape oil in the hour; for the lights of the second category, burning 140 litres an hour, the light is to be equal to 1·10 of that above given; and for the lights consuming 200 litres in the hour, it is provided that they shall yield 1·72 of the light of a carcel lamp as described. It may be stated that this standard corresponds very nearly with the English one, of what we should call seven sperm candle gas.

To enable any one to appreciate the position that the company occupies under this contract, it is necessary to observe that the coal used in Paris is mostly of Belgian and north of France origin; a small portion of cannel, or boghead, is only introduced when the illuminating power of the gas is below the standard. The average yield of this coal is about, per hectolitre (according to the figures that were published by the company in the course of the discussion that took place before the treaty was signed), gas, 22·94 metres; large coke, 31·11 kilogrammes; breeze, 12·07 kilogrammes; tar, 4·50 kilogrammes; and ammoniacal liquor of the value of 0.036 francs. The quantity of ammonia compounds that are present in the coal is considerable, and the company is obliged to exercise great precaution in ensuring the purification of the gas, in order to comply with the clause in their treaty which provides that the means they adopt for that purpose should be the best that are known. Yet with all these drawbacks upon the commercial results of the operation, the Paris Gas Company has always paid a good dividend, and the last distribution of profits was at the rate of 19 per cent.; whilst the average rate appears to have been of about 16 per cent.; a result that would cause great heart-burnings with the municipal reformers and the political economists of our own country, who will not allow any company to divide more than 10 per cent. The capital that is invested in the works consists of share capital 4,000,000 francs, and of bonds of the company about £3,200,000 sterling; or, in all, about £4,000,000, for a total population of 1,600,000 persons, which would make the rate at which the gas service of Paris is performed about £2 10s. per head of the inhabitants. This calculation, however, is somewhat in excess of the facts of the case, as the gas company has lately undertaken to supply some of the external villages of the Department of the Seine, such as Romainville, Puteaux, Charville, St. Denis, Maisons Alfort, &c., which form the subject of a separate treaty; but the above calculation may be taken as representing the proportionate price that is incurred in this service. It may be added that the price that is agreed to be paid by the communes beyond Paris for the lighting is, for the public lamps, 20 centimes per metre cube, or about 4s. 3½d. per 1,000 ft. c.; for the private lighting, 40 centimes per metre cube, or 8s. 7d. per 1,000; upon a descending scale that may reach, finally, 6s. 8½d. per 1,000, in proportion to the consumption. The high price that is agreed to be paid for this service may be explained by the length of main that is unproductive to the company in these cases; but it certainly seems to be exorbitant, when the freedom of the gas from *octroi* dues and other municipal taxes is taken into account. The company is bound to conduct, in every instance, the gas to the front entrance of the subscriber, and the latter is entitled to employ whomsoever he thinks fit to execute the distribution of the gas in his interior; and, provided the subscriber presents the certificate of the prefect or his delegate, that the works are well and properly executed, the gas company is bound to supply the subscribers with gas. The expense of branching upon the main and leading to the meter, is, of course, borne by the subscriber; the meters, as was said before, are bound to be of approved patterns, and verified as often as may be required by the police; they are furnished by the company, but are at the charge of the housekeeper, as far as regards their first cost and repairs, if those are undertaken at his request.

It may be remarked that the system of regarding the supply of the gas consumed in Paris as a municipal service, has entailed upon the private consumers the necessity of paying a higher price for the gas they consume than they would naturally do if the service were left to be regulated by the ordinary rules of trade. The municipality, in the exercise of its rights over the surface of the roadway in fact, has only consented to grant the monopoly of the gas supply to the company, on the condition of their supplying the public lamps at reduced rates, and of sharing in the profits of the concern after it has been established such a time as is sufficient to relieve it from any chance of failure. It is true that, in this manner, the town authorities will be enabled to devote a portion of the profits arising from the sale of gas to the relief of the other taxation of the town; but this is only an indirect way of making the consumers of gas pay for the water, paving, or other municipal services; and it is objectionable, as the control of those services can never be efficiently performed so long as the total expenses of them are not distinctly brought under discussion. The worst of this system is, that the price of gas can hardly ever be reduced, as the municipality is directly interested in the maintenance of the rate of profit. The precautions then taken to ensure the delivery and the quality of the gas are, therefore, quite illusory, and they seem to be intended rather to lull the suspicions of the consumer than to exercise any real influence upon the operations of the company, for so long as the quality of the gas is equal to the average quality that is distributed in the French towns, there is no probability that much fault would be found with it, let it be ever so bad.

At present there may be found a great amount of the ammonia compounds in the gas, and it is rather deficient in the illuminating power when compared with the London gas, but this may be owing to the quality of the coal that is used. The effect of the participation of the town in the profits of the company must, however, be such as to superinduce a carelessness on the part of the *employés* who are charged with the verification of the quality of the gas, and of the means adapted for ascertaining the quantities supplied. There is now apparently a great deal of anxiety displayed by the town authorities about the illuminating power and the purity of the gas, for they have organised a complete system of control and superintendence of both the public and private lighting, that appears, at first sight, to be most efficient. There are twenty-one persons who are constantly employed in testing the gas, and who are paid at salaries varying from £200 a-year to £48, the total sum voted for the salaries of these people for the next year being about £1,060; there are also 130 inspectors of the public lighting, at salaries varying from £200 a-year to £48, who figure in the town budget for a total sum of £10,480: and 32 inspectors of private lighting, who

are charged with the verification of the metres; these are paid salaries varying from £240 to £40 a-year, and they figure in the budget for £2,600. The superintendence of this service is, theoretically, very well arranged; it reremains to be seen whether it will really operate for the protection of the inhabitants, when the town has a direct interest in the successful results of the company, which it will have when the period of sixteen years, during which the company has the enjoyment of all it can make, shall have expired. All these questions, of the power of a municipality to interfere with a private company, however, form part of the greater question of the organisation of the relations between the public body and the private citizens, that admits a question of widely-different solution, but it would be somewhat out of place to discuss them here, as they would be better treated in a separate paper. The object of the present one is to endeavour to trace the system adopted by our French neighbours in the supply of gas to their capital; and, therefore, after having stated the conditions that the company and the municipality have agreed upon, it is proposed to state the manner in which the former of these parties has endeavoured to fulfil its part of the contract.

There are in the neighbourhood of Paris, and within the lines of the fortifications, ten gas stations, of different capacities, but all subordinate to the great station of La Villette. These stations are—1. La Villette; 2. Les Ternes; 3. Passy; 4. Vaugirard; 5. Ivry; 6. Charronne; 7. Belleville; and the three that are situated in the surrounding communes of St. Denis, Boulogne, and Charenton. As was said, the station of La Villette is the most important of these; it suffices for the manufacture of one-third of the gas that is consumed in Paris; the stations of Passy and Vaugirard supply together almost another third; and the other stations contribute about equally to the total consumption. The centre of the consumption is about the Church of St. Eustache, and the positions of the stations have been so chosen that they are mostly situated upon a circle, whose radius would be about that of the distance of the station of La Villette from that point. The station of La Villette is situated on the extreme verge of the town, being only separated from the fortifications by the military road; but the other works are often situated in the densely-peopled parts of Paris, to the great dissatisfaction of the *Conseils de Salubrité*, who complain very much of the smells given off in the process of manufacture. As, however, all the operations connected with the conversion of the residual products of gas making are carried on at La Villette, there seems to be little reason for finding fault with the company on this score; but the tendency of the sanitary reformers to hunt up, as it were, the factories that have been moved once in accordance with their suggestions, is not the less worthy of remark. The preference for La Villette, as the principal station for the manufacture of gas, may, however, be easily explained: it is situated in the quarter that is entirely manufacturing, and is in the immediate vicinity of other similar establishments; it is immediately upon the canal that brings to Paris the produce of the northern coal-fields of France; it is traversed by the Northern, the Eastern, and the Central Railways; and though it is somewhat high as compared with the level of the lower part of the town, it is only a little above the average level of Paris. The coal stores, which, by the way, are bound, by the treaty with the town, to be large enough to hold two months' stores, the retort houses, the coke stores, and the purifying houses, are situated on the north of the Chemin de Ceinture; the gas-holders are situated on the south-eastern side of that line; and the establishment for the conversion of the waste products is situated towards the north-west of the retort house, being separated from the latter by the Chemin d'Aubervilliers. The total area of the establishment is from 120 to 130 English acres.

On this plot of ground the retort houses are erected, and are provided with, each, a set of condensing pipes immediately adjoining the retorts, and a set of coke towers, or scrubbers, and the purifiers, that are within a series of buildings parallel to the retort houses, but separated from them by a paved court. The retorts are set in beds of eight each, back to back; the group of eight having seven retorts in each that are double, so that the total number of retorts at work at present is about 1076; but the quantity of gas that the company makes is considerably increased by the product of the ovens, from which it obtains smothered coke, for the use of iron and brass founders, railways, &c. The style of retort used is a clay retort, of the usual D shape, that is about 8 feet 2½ inches long, by 2 feet 4 inches wide, and 1 foot high in the clear; and it is to be observed that the French engineers prefer the use of the closed retort over the fire-clay ovens to that open at both ends (as in some of the London companies' works), for they contend that it is impossible to maintain an equal temperature in the ascending mains that must be used in the latter case, so that the gas escapes up one of these to the detriment of the illuminating power, or to the destruction of the dip pipe, according to the temperature. The gas in the Paris works passes from the retorts into an hydraulic main, and thence through a set of condensing pipes, that are placed outside the building, in sets of three rows of ten pipes each, to the set of double retorts. An exhauster here takes the gas, and thus relieves the retorts of the back pressure; this exhauster is set in motion by a steam engine of 16 horse power. There is a second machine, for the purpose of relieving the pressure upon the coke ovens, and this gives rise to special arrangements for condensation, purification, &c., to be noticed hereafter, and quite distinct from the ordinary service of the gas factory. The exhauster takes the gas from the condensers, which are made particularly large, so as to effect the greatest possible amount of condensation (which the French engineers attach great importance to, as a means of ensuring the purification of the gas), and passes it to the scrubbers and the purifiers. In the scrubbers, or the coke towers, the gas is subjected to a system of washing, for the purpose of extracting as much as possible the ammoniacal liquor, the tar, and the sulphur compounds, that it may still retain; and then passes, without any intermediate process of washing, to the purifiers, where it is exposed to the effects of a mixture of sulphuret of iron, lime, slacked and in powder, and sawdust, in the proportions of 1 metre cube (about 1¼ yard cube) of sawdust to 0·10 metre cube of lime in powder, with about 2 cwt. of sulphuret of iron. This mixture is found to be preferable for the purification, as it is capable of being renewed several times, and is especially used in France, because there the agricultural interest does not appreciate the employment of the lime refuse of the purifiers. The gas here is passed through four successive layers, or rather series of layers, of the description above given, and is then passed through the station meter to the gasholder where it is stored for distribution.

There appear to be differences of opinion amongst the Paris engineers with respect to the conditions of the distillation of their coal, and with respect to the methods to be adopted to prevent the formation of the sulphide of carbon in the gas. The present practice of the gas company is, however, that of effecting the distillation with great rapidity and at great heat, and combating the tendency of the gas to the formation of the sulphide of carbon, by means of a most energetic condensation. The charges that are generally employed are four-hour charges, at high initial temperatures, of about half a ton to each retort; the French engineers obtain from this quantity of coal the average yield of 9,300 to 9,500 cubic feet of gas (which is more than the London companies on the average do from the superior coal of Newcastle), and about 13 cwt. of good merchantable coke per ton. The proportion of condensing surface that is found necessary under the French system of replacing the washing by an energetic condensation, is about 20 feet

superficial to every 1,000 feet cube of gas made; and the surface of purifying medium that is used is about 4 feet for the same quantity; formerly the washing was performed by an additional process before the gas passed through the purifier, and it consisted in the gas being forced to bubble through a solution of ammoniacal liquor after it had passed through the coke towers, but now this process is dispensed with, so far as regards the passage of the gas through the ammoniacal liquor. The gas passes through the station meter, and from thence it passes into the gasholders preparatory to the distribution; these are eight in number, at the station of La Villette; they are 107 feet in diameter, and 46 feet rise in a single lift, and are supported by a scaffold in the centre when down. The distribution of the gas from these reservoirs takes place under the pressure of rather more than 1⅛ of an inch during the day time, and in the night time of 3⅜ to 3¾ of an inch. It may be that this pressure may be required to overcome the difference of level of the factory, which is somewhat above the points of delivery in Paris; or it may be accounted for by the small dimensions of the distributing means. The efforts of the company are, however, directed to the remedying this cause of loss, which must always, to a certain extent, act to prevent the due proportion between the mains of distribution and the quantity of gas they would discharge in a given period of time being observed, owing to the interest the company have to continue their working through the pipes that they are bound to yield to the town at the expiration of their lease. By the peculiar arrangements adopted, the Paris Gas Company has reduced the loss that ensues from the excessive pressure that accompanies the distribution of the gas to a minimum. We shall have occasion to revert to this subject; but it may be as well to state that the loss of the gas registered by the station meters, both in private consumption and in public lighting, was, in the year 1864, only 10 per cent.—a most insignificant proportion, if the quantity that is lost by the condensation in the mains, the amount that is not carried to account by the private consumers, and the thousand causes of loss that the gas must be exposed to, are taken into account. The average loss of the London gas companies is at least from 15 to 25 per cent. of the quantity they register at the stations.

There are at La Villette numerous contrivances for the preparation of merchantable coke that are well worthy of attention, but which it is not worth while to describe at present, inasmuch as the care with which this branch of the manufacture is conducted is essentially a local necessity, called for by the habits of the Parisians. The same thing may be said with regard to the conversion of the tar, ammoniacal liquor, and other waste products, all of which the Paris Company is obliged to convert to useful purposes themselves, but which we in England find can be more economically converted by the means that our manufacturing chemists make use of. There is, no doubt, immense skill displayed in this detail of the Paris fabrication, but it may be passed over, together with the brick, tile, and retort factory that forms an important part of the establishment at La Villette, and which manufactures for all the other stations in Paris. In Paris, the gas company had, in fact, to organize every detail of the service, and to create the industries that are connected with the disposal of the coke and the refuse, and that were necessary for the making of the gas; they, therefore, were deprived of the advantages that the English companies possess in the greater division of labour that prevails in their country and which permits them to concentrate all their attention upon the strict object for which they are established. The coke ovens mentioned above may be cited as a proof of this; they are calculated to convert about six tons at a time, that yield about 8,000 or 8,500 cubic feet of gas to the ton, and 13 cwt. of smothered coke; but both the gas and the coke that are thus obtained are of inferior qualities of their respective kinds; both tend to lower the lighting and heating power of the gas and coke they yield. The brick and fire-clay manufacture of the Paris Gas Company, however, yields products of a superior kind; but it is to be suspected that it does so without much reference to trade profit; and the same may be said of the engine factory, where the company manufactures for sale the Lenoir's engine, so extensively used in building operations in Paris. It is found that, with all the disadvantages that the Paris Gas Company has to encounter in the disposal of their waste products, they manage to derive from their operations upon the coal they consume about the proportions of 1,000 for the gas, 200 for the coke, 20 for the tar, and 2 for the other residual products. The tar, it may be added, is never burnt under the retorts; it is too valuable, and meets with too ready a sale, to allow of any such application; the ammoniacal liquor is principally used for the preparation of sulphate of ammonia, that meets with the readiest sale in England.

It is calculated that the total yield of the La Villette station is about equal to five millions of cubic feet per day when the works are in full operation; and the distribution of this quantity takes place in the busiest and most bustling part of the town. The other works do not present anything very particular, excepting perhaps the station at Vaugirard, which is specially reserved as an experimental station, and where the company have been at work for the last three years upon Mr. Siemens' system of economising the heat that is employed to produce the distillation of the coal; hitherto without success, it must be observed. The Paris Gas Company, by their monopoly of the supply, are enabled thus to "try all things" that are proposed in the matter of lighting with the best means and appliances that can be disposed of.

The distribution of gas takes place through mains that are of as large diameter as 3$\frac{3}{10}$ths feet, exactly one mètre, they are all of wrought-iron, upon Chameroy's patent, and in that respect the Paris supply differs from that of London, which, in consequence of Mr. Michael Angelo Taylor's Act, is compelled to receive its gas supply through cast-iron mains. The Chameroy pipes are put together in lengths of 15 or 16 feet; the joints are rivetted and brazed; the whole is then coated with a preserving coat of bitumen, and the joints are made with a male screw on one end, and a thickening out, formed on a mandril, to receive a female screw on the other, which is then packed with gasket and white lead. The opinions of English engineers are unfavourable to this style of pipe, but the experience of the Gas Company of Paris for the last twenty-seven years seems to be decisive as to its merits in all cases where the soil is of an alkaline nature, and is not charged with water. I was informed by M. Camus, the sub-engineer of the works, who is also an Engineer of the Ponts-et-Chaussées, that he had ascertained the wear and tear of 1,000 metres of wrought and cast-iron mains of the same diameter, respectively, in the course of the year 1861, and he found that they presented the following results. He found that the cast-iron showed that the proportion of the leakage, that was owing to accidental breakage in the pipes, was 1·000, whilst that quantity was, for the wrought-iron, 0·460; the proportion of loss through the use of the pipes by time or depreciation was, for cast.iron, 0·353, for wrought-iron, 0·198; the proportion of loss by shaking of joint was, for the cast iron pipes, 1·77, for the wrought-iron, 0·520. There may be greater care and attention paid in Paris to the repairs and maintenance of the pipes, but the results of the experiments tried in this case seem to indicate that the cause of the diminished loss upon the registered quantity of gas must be sought for in the use of these mains; and at the present day, when so much attention is forcedly turned to the question of the leakage of gas pipes, on account of the construction of subways by the Metropolitan Board of Works, the subject acquires additional interest. The house distribution also takes

place in Paris through lead service pipe, that must be another cause of diminished leakage; but the private consumer is at liberty to employ whatever system he may think proper after the passage of the gas through the metre. From the report of the gas company, to their shareholders last year, it appears that the total consumption of gas in Paris was about 3,567 millions of cubic feet, for a population that was estimated at 1,650,000; and the company had, in their prevision of an increased demand, increased their manufacturing powers to 4,141 millions. The length of pipes that were employed in the lighting of Paris was 546,861 metres; that of the annexed zone, of 424,985 metres; that of the banlieue and the surrounding district, 165,346. The number of public lights supplied by the company for the account of the municipality was 26,849; the number of private consumers was 59,554, in the year 1863, the last for which I have been able to procure the returns. It may be added that the lamps that are used for the lighting of the Boulevards are placed at distances of 25 metres apart on the same line; in the Rue de Rivoli they are about 14 feet apart; in the court-yard of the Louvre they are about 20 feet apart; the burners being, in the majority of cases, at 10 feet above the pavement. The lighting of Paris is, in fact, most brilliantly and lavishly executed, in the best quarters of the town at least; it leaves, however, much to be desired in the poorer portions, which are about as badly lighted as the analagous parts of London.

I have mentioned the desire that the public seem to have at present for the laying of the pipes in the subways that have been constructed by the Metropolitan Board of Works, and have hinted at the provisions that have been introduced into the treaty that prevails between the City of Paris and the gas company, with the object of facilitating the placing of the pipes in that manner. The treaty contains, indeed, a clause to the effect "that the town reserves to itself the right to displace, and even to remove altogether, at the expense of the concessionaires, and without any indemnity, the pipes every time that it may think the public interest may require it. If it should suit the municipal administration, during the continuance of this lease, to relieve the public ways of the excavations necessary for the laying of the gas pipes, and to dispose the sewers so as to receive them, the concessionaires shall be bound to remove their pipes to the positions prepared for them, at their own expense, upon all the points where the city shall have executed the works for this purpose." Yet with this precaution and this right, the city of Paris does not think of calling upon the gas company to remove their pipes; nay, the water pipes are in Paris carried into the sewers, which are there rather subways than simply sewers, and the engineers of the city most energetically oppose the introduction of the gas pipes into them. Experience has shown that there are fatal causes at work to produce the explosion of the escaped gas in these cases, which all the care of the engineers cannot guard against. There have been three accidents, as M. Belgrand informed me, in the gallery of the Rue des Martyrs; there have been two accidents in the court-yard of the Louvre; and the accident that took place last year, the consequences of which I myself saw, on the bridge of Austerlitz, was a fatal commentary upon the danger of the system of laying the gas pipes in subways. In this case the pipes were carried over the haunches of the bridge in a gallery that had an entrance at either end, that served as a means of ventilation, and it had a means of escape in the middle; the gas was shut off at both ends, and the quantity there was in the pipes allowed to burn off; yet an explosive mixture was formed, and it was set on fire, probably by a workman throwing down a match. Fortunately this occurred in the early morning, and the few people there were passing the bridge were attracted to the side where they could witness the passage of a steamer that happened to be passing; there were consequently no passers-by injured, but two workmen were killed, an several others were carried off to the hospital; the whol length of the pavement of the bridge was blown up fo the length of 180 or 200 metres, and about 12,000 fran worth of damage done to the bridge. M. Belgran was, in fact, quite borne out in his opinion, that "in n city where there was anything like a regard for huma life, would the notion of carrying the gas-pipes in covered way be for an instant tolerated." He had, i must be observed, more than eleven years' experienc in the Paris subways, and yet, with all the advantage o the most careful superintendence by the engineers of th Ponts-et-Chaussées, and the effect of the French law o compensation for accidents, to enforce the observance o the necessary precautions, he did not scruple to com over here to London to give evidence against the schem of the Metropolitan Board, that is again brought befor the public with so much persistency. The fact is, that without a regular system of ventilation, that would entail an enormous outlay, there cannot be any safety in the system of subways as applied to gas pipes; and the Metropolitan Board do not seem to have contemplated the execution of even the smallest precaution for this purpose.

The Paris Gas Company is managed, as all the important operations of that country of a similar nature are, upon the strictest principles of discipline, order, and superintendence. The administration is composed of a certain number of directors, who are chosen from th body of the shareholders, generally speaking fro amongst the original proprietors in the various gas companies that were amalgamated together, and they are assisted in the management by M. Gayffier, ingenieur-en-chef des Ponts-et-Chaussées, and M. Camus, ingenieur-ordinaire of that body, who have under their orders a numerous staff of engineers, chemists, practical me and clerks, that would frighten any English board o management. Thus the expenses of the salaries to th various people employed in the factory, in the maintenance and laying of the mains, and in the office of th company, was not less than about £88,000 in the cours of the year 1863; but at this charge the service i performed with a degree of perfection that we in England have no conception of. The cost of every detail of the manufactory is known to the last centime; the waste that attends the operations of the London companies is unknown; the accounts are kept in the mos elaborate manner, and the gas company provide fo their own servants with a liberality that we in England have no conception of. The result of the system is, that in Paris the gas works are managed at about 36 per cent. of the total receipts; which may be accounted for by the fact of the great success of the speculatio that the directors manage, and by their having n inducement to introduce any great economy in th working, in consequence of the participation of th town in the profits of their concern after a certain tim There is, indeed, every inducement for the directors t indulge in expense in the management; none to indu them to save; and as the city of Paris has also a dire interest in knowing the cost of every detail of th fabrication of gas, it is questionable whether at any tim the *frais d'administration*, or the office expenses, will b much decreased. This is certain, that the Paris Ga Company is managed with consummate skill; and thoug we in England would do very unwisely, as I think, t adopt the system that prevails in the neighbourin capital with regard to the supply of gas—because i is founded upon principles of political econom which are, I think, wrong, and it would involve a interference with our private habits, which I thin would be intolerable—yet there are many things th seem to be well deserving our study, and our imitatio in the manner the Paris Gas Company carries out it contract. The system at Paris is, in fact, designed fo the atmosphere of France; it would fail if introduced her where "every man does what he likes in his own eyes

DISCUSSION.

Mr. George Godwin, F.R.S., said they must be much obliged to Mr. Burnell for his admirable paper. Some important facts had been brought before them in a very interesting manner, but he was not able himself to agree with that gentleman in what appeared to be his leading object in the paper, viz., to make us more satisfied with what was done for us in England. It was not likely that Englishmen would put up with such a preposterous arrangement as was made for the inhabitants of Paris. The notion of tying themselves down for 50 years to take their gas at 6s. 8½d. per 1,000 feet (with allowances and deductions), notwithstanding any inventions and arrangements for cheapening it, seemed perfectly ridiculous. It was true if any new mode of lighting was introduced, the municipality could call upon the gas company to put it into practice, or could do so themselves without making compensation. After all, however, the people of Paris at that moment paid very little more for their light than in London. He was assured, on the best evidence, that the light there was much superior—in other words, that a certain number of cubic feet of gas in Paris gave more light than the gas of many of the London companies, who, even at the present day, supplied an article that was very far from satisfactory. It was true the municipality of Paris partook of an advantage to the extent of 5½d per 1,000 feet and divided the profits beyond 10 per cent. after sixteen years; so that they had an interest in keeping up this price. It was not likely that we should permit such an arrangement; although we were, perhaps, not much better off with our arrangement than the Paris people. It occurred to him some years ago to initiate a movement against the high price charged by the gas companies in England, and against their management. It went on for a long time, and was taken up by others, but it brought him nothing but personal abuse, and even such an instance as a man holding a large number of gas shares, at whose house he was visiting, putting a pistol to his head and saying if it were not for the consequences he would blow his brains out, because the course Mr. Godwin had been taking was likely to ruin him and his family. A few years after that very person derived 25 per cent. more from his shares than he did when that movement began. The gas companies took the usual course of opposing improvements and keeping up the price, but they were forced into a movement which damaged some of the old companies, and this would be the case again if they persisted in their opposition to the gas pipes being laid in the subways formed for them. He regarded it as idle to say that the escape of gas could not be guarded against. They were told that the escape from the mains was still very great, as was manifest from the state of the soil round the joint of an old gas pipe; the loss to the companies was great; the damage to health would be great, by-and-bye; and in order that they might go on laying down pipes with bad joints and other careless arrangements, they brought forward the evidence of one solitary French engineer to prove that explosions were a necessary consequence of pipes being laid in subways. In the case of Nottingham the system had been carried out without damage, and he was satisfied that this plan was a perfectly practicable one, and it would be a disgrace to the companies if they persisted in opposing its adoption. In many buildings he had seen as much as half a mile of pipes of iron and of softer metal running through the different rooms, but there was no escape of gas because the joints were properly made. He was satisfied if the gas mains were laid in the subways, and a proper system of ventilation provided, no better plan could be adopted. At present the public were subject to the perpetual annoyance of disturbances of the streets, and he could state that within three years Long-acre had been closed for traffic on five occasions during the laying of gas and water pipes and the construction of sewers. All that nuisance might be avoided by using the subways, and notwithstanding Mr. Burnell's eloquent endeavours they must persist in pressing this matter on the attention of the gas companies, and if they would not afford the public redress, it was to be hoped that the legislature would do so.

Mr. Thomas Hawkesley entirely disagreed with the gentleman who had just addressed the meeting. He (Mr. Hawkesley) had had thirty-five years' practical experience of this subject, having been the engineer of the Nottingham Gas Works, to which Mr. Godwin had alluded. He would tell them the real facts of the case. The subway at Nottingham was a little pitiful channel, of about 200 yards in length, and the gas-pipe which was laid on it was four inches in diameter, the street having very few houses, and, consequently, there were very few branches from that pipe. It so happened, also, that this little channel had a rise in the short length he had stated of very nearly 40 feet, and consequently it ensured for itself a tolerably good ventilation. He need hardly say that these were circumstances which did not apply at all to such a place as the metropolis. It was remarkable how great were the apprehensions of the workmen of the gas company in reference to this subway, for they would not go into it unless the gas was shut off, and even then they used a safety-lamp. They were told that gas had been laid in subways, and that gas had been lighted in them without danger, but the danger was occasioned by the insidious escape of gas by leakage, and when this occurred in any confined space, an explosive compound was formed, which was liable to produce a most serious disaster, particularly in a subway, where the whole street might be bodily raised up, and the passers-by would run the risk of being injured, if not killed. A good deal had been said about the escape of gas in the streets, but he would assert that it did not reach to anything like 5 per cent.; in general it was much less. What was called leakage was simply the loss which a gas company sustained upon the gas, as ascertained, in the first place by the meter at the stations, and in the second by the money which the gas company received. A thousand and one things happened between the station meter and the receipt of the money by the company. In the first place there was leakage at the works, which was very considerable. In the next place there was the consumption of gas upon the premises, which was to be counted by millions of feet a year, and which very few gas companies took into account. Then the gas went into the mains, from which there was a very slight escape indeed, and that escape passed into the soil, where it was absorbed without danger. A great loss occurred from the service-pipes, much more than from the mains of the company. That was a loss which ought as far as possible to be prevented, and if gas companies generally used lead pipe instead of wrought-iron for services, as was done in many places with great success, they would not suffer in this way. The gas eventually went to the meter, which professed to measure the whole that passed through it, but it often did not, and any defect of the meter, whether wet or dry, was against the gas company. Then there was all the surreptitious and fraudulent consumption of gas, which in a great city was not inconsiderable. Then, further, there was the waste in the public lamps, which was greater than any other, for this reason: each lamp was a consumer with only one light, and the pipe must be as full of gas for that consumer as for a private consumer using ten or twenty lights, and thus there would be a greater proportion of leakage. All these things put together went by the general name of leakage, whilst the escape from the mains of a well-managed company was not more than 2½ per cent. Mr. Hawkesley instanced the case of a gas company in Denmark whose works he superintended, and in which the whole leakage, over a period of three years, did not average 5 per cent., and at Nottingham, before the introduction of Lord Redesdale's Meter Act, the leakage was as low as 8 per cent., but owing to the operation of that Act it had latterly been as much as 14 per cent.

The way in which accidents would happen in subways was this:—A gas company alone could not control all the operations of the subway; other workmen would be employed there who might be the occasion of accidents. If the streets of London were generally subwayed, he had no hesitation in saying that with 2,000 miles of subway, there would not be a day without an explosion, if the gas mains were laid in them; and it would be impossible, in the nature of things, to prevent this. If they had gas-pipes in the subways, they must have workmen there, and they would also have the London thieves there, to the great peril of the jewellers' shops which were contiguous to the subways. Passing now to what had been said with regard to the gaslights in Paris, he would say he did not find anything better there than we had at home. The quality of the gas, the mode of manufacture, the amount of production, and the system of distribution, were in every respect inferior to what we had here, and, above all, the price of gas was fifty per cent. higher than our maximum price. The French system of political economy was the worst that could possibly be adopted. It was a system by which the municipality was bribed to participate in the profits on high prices, and the consequence was that those who consumed gas were made to pay a portion of the taxes of those who did not do so. The same thing had been attempted with various degrees of success, and want of success, in this country, a notable example of which existed—and to a certain extent still exists—at Manchester, but under modified circumstances. For many years the corporation of Manchester charged a very much higher price for their gas than the companies in the surrounding towns, and the money so obtained was applied to municipal purposes. The consequence was a certain portion of the community were taxed for the benefit of the other portion. For a time that system went on very well, but it ultimately gave rise to a violent class agitation, which it was always desirable to avoid; one portion of the community was arrayed against the other on the price of gas, and that went on for several years, and at last resulted in the gas consumers beating the non-consumers, and then the price of gas was brought down to something lito a reasonable amount. To go into a comparison of the systems in France and England would occupy too much time. All he would say on that point was—Paris was a much better lighted city than London, but the Paris gas in illuminating power was inferior to ours. The fact was, in Paris the people lived, not as we did, one alongside the other, but one above another, and the consequence was the population there was distributed over a much shorter length of streets. In Paris they had one lamp to every 60 persons; the consequence was, that in the principal streets the lights were brought very close to each other; but it did not thence follow that because the city was better lighted, the gas was better. Its inferiority was accounted for by the description of coals they used; they, nevertheless, made as good gas as they could under the circumstances, and they took good care to use the kind of burner which gave the most perfect combustion. This was a matter which was neglected in London, but we were improving in that respect; and when we paid as much attention to these details as was done in Paris, the London gas would give a greater amount of light than that in Paris.

Dr. Wylde remarked that in the present advanced state of science there might be no practical difficulty in the employment of the subways of cities as channels for the laying of gas and water mains, so as to prevent the constant annoyance arising from breaking up the streets for those purposes. He argued that equally in subways as in large ramifications of pipes in hotels, &c., the exercise of the olfactory nerves would always sufficiently indicate an escape of gas to a dangerous extent; and in the case of the mains of a gas company, the great thing to be attended to was the proper jointing of the pipes, by which the escape of gas into the subways would be effectually prevented.

Mr. Gore, having had some experience in the laying of gas mains in this country and abroad, was inclined to think that the promoters of the subway system were at the present moment somewhat in the dark on that question. He could quite understand that in situations where there was a sufficient current of air to carry off the escaped gas there could be no explosion, but it did not follow that in a subway the current of air would be so rapid as to have this effect. Having been engaged, in 1861, in laying down gas mains in Valparaiso, the geological formation in some parts was such that at six inches below the surface of the soil granite was reached, and through that material a channel had to be chipped away of sufficient depth to admit of the gas main being laid down. Theoretically that would be supposed to form a very beautiful channel in which to lay the pipes, but a reference to the books of the company would show that the cost of repairs in that channel alone amounted to seventy-five per cent. more than in double the length at other parts of the town where the pipes were laid in a different material. Mr. Hawksley had very properly said that the soil was the best safeguard against the escape of gas, and at the same time it formed the best elastic cushion on which to lay pipes. In laying pipes in a subway, there must be a number of rigid fixed points or brackets on which they must rest, and there would be a severe vibration occasioned by the traffic passing overhead; the effect of which on cast-iron mains so supported would, in a very short period, be very serious, in causing leakage at the joints. He (Mr. Gore) was now engaged in preparations for lighting with gas the city of Mexico, and he had visited every establishment at which he thought he could gain information. Amongst others he had met gentlemen connected with the subways in Paris, and on his mentioning the subject to them, they strongly advised him not to carry the mains through subways.

Mr. W. Macfarlane was not satisfied, upon the evidence adduced by Mr. Burnell, as to the undesirability of the employment of subways for the laying of gas mains, nor did the observations of the last speaker satisfy him more on the same point. He thought if they were not prepared to alter the material of the pipes they must alter the construction of the joints, for if they put pipes in a subway with the present system of jointing, there would be a liability to great escapes of gas. There was, however, no reason why an improvement should not be made in this respect. The question was whether iron was the proper material for the pipes, unless the interior were coated with a preservative substance; and if, besides this, a better system of joints were introduced, he had no doubt that subways might be used for gas-pipes without danger.

Mr. Burnell, in reply upon the discussion, would simply refer to the observation of Mr. Godwin that the practical objection to the use of subways for gas mains rested on the sole testimony of one French engineer, M. Belgrand. Upon that he would remark that he had referred especially to that gentleman because he was the principal engineer in that department in Paris, and had had the largest practical experience in the laying of gas pipes in subways. He might mention that M. Belgrand's evidence on that point was confirmed by the opinions of M. Dupuit, who formerly occupied the position of M. Belgrand, by those of MM. Mouton and Huet, engineers of the Ponts-et-Chaussées, and also by M. Leloup, inspecteur des eaux, as well as MM. Gayffier and Camus. The only evidence in Paris anything like favourable to the subways was that of the architect of the Louvre. Therefore, on the one side they had the evidence of engineers who had been practically concerned in the laying of pipes, and on the other side they had only the evidence of an architect. He could only say further, as to the quality of the Paris gas, it was

very much below that of London. In the former city the gas was called seven-candle gas, and in the latter the standard of illumination was eleven candles.

The Chairman said they must all feel indebted to Mr. Burnell for his interesting paper. It contained a large number of facts which could not fail to be of service to all who were interested in gas works. He confessed that on the topic which had received the largest amount of attention, he personally entertained some strong views. He was not at all afraid, though he had heard of explosions in the Paris subways, of such occurrences taking place in this country. Even if that room were closed up and the gas allowed to escape into it there would be danger of explosion; but if the upper windows were left open, with free ventilation from the bottom of the room, he should have no fear of this. Such a strong current of air might not be agreeable in a house, but it would not be objectionable in a subway. He had been present when gas was lighted in a subway and when, according to the views of some of his friends, an explosion should have taken place; but there was a sufficient current of air through it to almost blow out the flame of the gas. While that was the case there could be no fear of explosion from confined gas; and he was surprised to hear gentlemen say that proper attention had not been paid to that matter in the subways already constructed. It was true, as had been observed, that the subways were quite large enough for the entrance of thieves; but he had not yet heard of any depredations upon property through that means, and it would require the removal of a considerable amount of brickwork and other material to effect an entrance to the contiguous premises. He was sure all would agree that subways, if safe, must be of great public advantage. They could not fail to be a great benefit to the gas companies. He did not expect any great change to be effected without considerable opposition and discussion; but good resulted from this, for thus attention was drawn to any weak points, and those who had to conduct the improvements were led to avoid dangers that might otherwise arise. While so many advantages were held out he was persuaded that nothing would prevent this improvement from going on. Since this subject was first mooted he had seen great changes in public opinion, and in the minds of gas engineers themselves; and many who were opposed to subways—even amongst the engineers in Paris—were now looking forward to a better state of things, and even made propositions for introducing gas-pipes into the subways. He hoped a further discussion would take place on this subject, and that some of his friends would be led to modify their views. He was sure they would feel that a cordial vote of thanks was due to Mr. Burnell for his valuable paper.

A vote of thanks was then passed and acknowledged.

Obituary.

John Gibson, R.A., the eminent sculptor, died at Rome, on Saturday, the 27th January, in the 76th year of his age. He had been seized with a severe stroke of paralysis, from which there was no hope of recovery. He was born in 1791 at Conway, where his father laboured as a landscape gardener; but, fortunately for the child, circumstances compelled the elder Gibson to remove to Liverpool. Whilst living at Conway, young Gibson delighted in drawing on pieces of slate the geese, and sheep, and horses which he saw in the fields; and under his mother's fostering care, it is said, he acquired considerable facility of execution. At Liverpool, however, his fancy was fed with something higher, in the shape of art, than he had yet seen in the humble cottages of a Welsh town. Here he saw engravings, and studied and copied, all the while training his eye, heart, and hand. At the age of fourteen he was apprenticed to a cabinetmaker, an occupation repugnant to his tastes, and afterwards to a wood-engraver, for which employment he felt a stronger inclination. Fortunately, however, a Mr. Francis, a partner in some marble works, who had heard of his skill and his remarkable fondness for art, purchased his remaining time for £70, and generously encouraged his abilities in designing, modelling, and the use of the chisel. He also introduced him to Wilkie Roscoe, the celebrated author of the "Life of Lorenzo de Medici," a no mean patron of literature and the arts, who at once conceived the idea of sending young Gibson to Rome. Commercial losses, which came heavily upon the illustrious merchant at this time, prevented his carrying out the idea himself, but he kindly mentioned the project to some of his wealthy friends, and a sufficient sum was soon privately subscribed for the purpose. In 1817 John Gibson started on his journey, encouraged by an interview with Flaxman in London, and with letters of introduction to Canova at Rome, from whom he received cordial welcome. Canova assured him that with steady industry he would be certain to achieve success, and promised him every aid that he could render him, even going so far as to proffer pecuniary assistance should he need it; this he did not. After four years' study under Canova, Gibson set up on his own account, and produced a group of "Mars and Cupid," which was shown to the Duke of Devonshire. His grace was struck with its merit, and directed the artist to execute it in marble; it now forms one of the leading features of the magnificent collection at Chatsworth. Another of Gibson's earliest works was a group of "Psyche and the Zephyrs," which was purchased by Sir George Beaumont, but so highly was it admired, that young Gibson was requested to execute duplicates of it for Prince Torlonia and the Hereditary Grand Duke of Russia. On the death of Canova he became once more a pupil, and entered for a time the studio of the great Spanish sculptor Thorwaldsen. In 1823 Mr. Gibson was elected an associate of the Royal Academy, and in 1836 he became a Royal Academician. However, with the exception of short visits made to this country, he resided almost entirely at Rome, and so widely had his fame extended that his studio was the resort of the patrons, practitioners, and lovers of art. From the commencement of his career to the time of his death he devoted himself mainly to classic and poetic sculpture. In portrait statues his chief efforts have been; two of Her Majesty; a colossal figure of the late Hon. William Huskisson for the cemetery, Liverpool, a copy of which has been produced in bronze to adorn the front of the Custom-house of that City; Sir Robert Peel for Westminster Abbey; Mrs. Murray, exhibited at the Royal Academy in 1846; and George Stephenson, exhibited in 1851. He has also executed several monumental tablets and bassi-relievi. Several of Gibson's statues were tinted, the most remarkable being his celebrated Venus, which attracted so much attention at the International Exhibition of 1862. This was executed for the late Mr. Robert Berthon Preston, of Liverpool, and is now in the possession of Mrs. Preston, of Richmond-hill. England is tolerably rich in the *chefs-d'œuvre* of Gibson, some one or more of which have found a place in every good collection. Liverpool is particularly well supplied with specimens from his chisel; and the inhabitants of that city have not been backward in showing their appreciation of his merits, and in regarding him with pride as a fellow-townsman.

Publications Issued.

Modern Marine Engineering applied to Paddle and Screw Propulsion. By N. P. Burgh, engineer. (*E.* and *F. N. Spon.*) To be published in fifteen monthly parts, demy quarto, part 1 ready on the 1st January, 1866.

and the remainder consecutively.—The work treats on ordinary, compound, and expansive engines adapted for paddle, single and twin screw propulsion; surface and injection condensers; expansion, equilibrium, slide, and other valves; link motion; starting gear; thrust blocks; paddle wheels; screw propellers; ordinary and super-heating high and low boilers. The plates will be correctly tinted to pourtray the different materials with the recognised colours adopted by engineers for practical purposes. The complete work will comprise 300 pages of letter-press matter, illustrated by thirty highly-finished plates of engines, &c., contributed by the most eminent firms in England and Scotland. Numerous clear woodcuts will be interspersed, in order to assist the student as well as refresh the memory of the learned. All the examples depicted will be those of the latest and best known design and construction.

Notes.

AERONAUTICAL SOCIETY OF GREAT BRITAIN.—This society has been formed under the Presidency of the Duke of Argyll, the Duke of Sutherland and Lord Richard Grosvenor, M.P., being Vice-Presidents, and Mr. James Glaisher, F.R.S., being the treasurer. Among the Council are Sir Charles Bright, M.P.; Dr. Hugh W. Diamond; Mr. William Fairbairn, LL.D., F.R.S.; Dr. John Lee, F.R.S.; Mr. H. E. Westcar, and others. Its objects are to foster and develope the science of aëronautics, which has stagnated for so many years, and incidentally therewith to increase our knowledge of aërology. In the hands of private individuals the progress made in aëronautics has been for any useful object almost *nil*. The great expense attending the necessary experiments combined with the absence of scientific and mechanical attainments on the part of aëronauts generally, considered in conjunction with the fact that their balloons were often in profitable requisition for purposes of amusement have doubtless contributed to the present uninteresting and unsatisfactory condition of the science of aëronautics. There are, however, many who have hoped much from the conjunction of educated science with balloon pioneering, and the Council of this Society are encouraged to believe that they will be supported in their efforts by the contributions of well-wishers. It is proposed to admit to membership upon payment of an annual subscription of £1 1s., and to appeal to the public for donations; to rent ground and construct balloons and apparatus for experiments; to furnish subscribers with tickets of admission to the grounds upon public days of experiments, and to issue a periodical of transactions and intended experiments, and to issue tickets for a seat in the car upon one of the days of ascent, the determination of which will take place by ballot amongst those subscribers who shall have sent in their names previously for that object. In a shed constructed for the purpose it will be possible always to maintain one of several balloons inflated ready for ascension, and if it were needful, and the Society possessed sufficient members, an ascent might be made every day at a certain hour (weather permitting). Persons desirous of membership should apply to the honorary secretary, F. W. Brearey, Esq., Maidenstone-hill, Blackheath.

Correspondence.

LABOURERS' DWELLINGS.—SIR.—Time did not permit of my saying a few words in regard to the very important subject mooted by Mr. Beggs' paper, read on the 31st ult. There is no doubt the main points to be attended to, in order to effect the great social improvements desired, were very clearly summed up by the chairman, as being the necessity for what was so ably insisted on by Mr. T. Webster, compulsory powers (properly r lated) for the acquisition of sites for improved dwellin the labouring classes in the business parts of the metr and other large towns; government loans, on si principles to the loans from government for drai &c., of land; and a system of selling freehol similar perpetual tenure rights in the separate tene comprised in large blocks of buildings. As it see have been thought that the last mentioned point wa presenting some practical difficulties, and some d ence of opinion seemed to exist as to whether the lute ownership of dwellings would be benefi exercised by some of the members of the indu classes, the following suggestion in reference thereto not be out of place. It is this:—the adoption o system of selling tenements on long leases, say 500 y renewable again and again for a small fine at pepper rent, with an annual payment of small amount, applied to the maintenance of the foundations, roo ternal walls, and necessary structural supports o block; the administration of this fabric-maintaining to be in the hands of trustees, who should be appo in the first instance by the erectors of the buildings, should be afterwards renewed by being nominated b old trustees, and elected by the owners of the va tenements. A board of this kind might be entrust enforce covenants to be inserted in each owner's co ance, this document being framed to prevent him grossly misusing his property to the injury of his n bours in the same block. Another suggestion, that not be unworthy of consideration, is this. In ma our business streets west of Temple Bar, east of gate, north of Smithfield, and south of the Thames, shops and warehouses are all that is of much avail, owners of them residing in the suburbs, and the up parts of the premises are not letable for offices, localities not being suitable. This being so, why co not the same measures be adopted as have been here fore adopted with regard to some hotels in the city, the ground and basement floors (and perhaps the f floor in some cases) could be effectually parted off fr the upper floor, which last could be fitted up as teneme for the more prosperous classes of our working m thus relieving the pressure upon the workmen's ho in the back streets. It has often occurred to me t something of this kind might have been done with so of those miserable carcases in Victoria-street, We minster, where there are ample opportunities for mak the entrances to the workmen's residences in a s street.—Yours, &c., F. W. CAMPIN.

Temple, 2nd Feb., 1866.

CONSERVATIVE LAND SOCIETY.—SIR,—Permit me a words in reference to the letter of Mr. Gruneisen, wh appeared in the last number of the *Journal*. Those have read my paper will see that my object was to s the success of freehold land societies in general, an direct attention to them as an important means of m ing one of the greatest wants of the age. As the b of my exposition, I did what I hope Mr. Grune would have done had he occupied my place on the e ing of the 31st inst., I took the society with the wor of which I was most familiar. In doing that I ha wish to advertise a society with which I have an mate connexion, and which needs no effort of that k much less did I desire to underrate the success of excellent society of which Mr. Gruneisen is secre I rejoice in the success of every freehold land soc As to the "singular inaccuracy" upon which Mr. neisen remarks, the figures were given to me by him I called upon him in August or September last, st that I was preparing a paper for the Social Science gress, to be held in the month of October at Shef In that paper the figures were used just as I rece them from Mr. Gruneisen, and were quoted freely by the local papers and some of the London papers, their correctness was not questioned. As I had a g ral principle to illustrate in my paper read before

Society of Arts, I took them as sufficient for my purpose. It appears, however, that in the interval another report had been issued by the Conservative Land Society, which included the results of the operations of twelve months not included in the statement given to me by Mr. Gruneisen. In the case of the National Freehold Land Society, I took the figures just as I used them at Sheffield, and did not give it credit for the results of the most successful year the society has ever known. This will be a sufficient answer to any suspicion of unfairness. Many successful societies might complain of no mention being made of them at all, but I did not aspire to give a series of statistical returns, but, as I have said, a number of facts to elucidate a principle.—I am, &c., THOMAS BEGGS.

37, Southampton-street, Strand, W.C.

MEETINGS FOR THE ENSUING WEEK.

MON.....Medical, 8. Clinical discussion. Mr. De Meric, "On the use of mercury in syphilis." Mr. R. Wm. Dunn, "On the mercurial and non-mercurial treatment of syphilis."
Asiatic, 3.
Society of Engineers, 7. Discussion on Mr. Thomas Adams' paper, "On the friction of the slide valve."
Society of Arts, 8. Cantor Lecture. Mr. Fleeming Jenkin, F.R.S., "On Submarine Telegraphy." (Lecture IV.)
R. United Service Inst., 3. Mr. H. D. Cuningham, "On his methods of working and training heavy guns."

TUES...Civil Engineers, 8.
Statistical, 8. Col. Sykes, M.P., F.R.S., "On the organization, strength, and cost of the French and English navies in 1865."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Professor Tyndall, F.R.S., "On Heat."

WED.....Society of Arts, 8. Mr. Thomas Gray, "On modern legislation in regard to the construction and equipment of steam ships."
Meteorological, 7. 1. Mr. C. O. F. Cator, "On daily weather diagrams, 1865." 2. Mr. G. J. Symons, "On the fluctuations of the annual fall of rain."
Geological, 8. 1. Mr. R. Lechmere Guppy, "On the Tertiary Mollusca of Jamaica." Communicated by Mr. H. Woodward. 2. Mr. R. Lechmere Guppy, "On the Tertiary Echinodermata of the West Indies." Communicated by the Assistant-Secretary. 3. Mr. R. Lechmere Guppy, "On the Tertiary Brachiopoda of the West Indies." Communicated by the Assistant-Secretary. 4. Mr. J. Young, "On the affinities of *Platysomus* and allied genera." Communicated by Prof. T. H. Huxley, F.R.S. 5. Dr. John Young, "On the scales of *Rhizodus*, Owen.
London Institution, 7.
R. Society of Literature, 8½.
Archæological Society, 8½.

THURS...Royal, 8½.
Antiquaries, 8½.
Philosophical Club, 6.
Royal Inst., 3. Professor Tyndall, F.R.S. "On Heat."

FRI.....Royal Inst., 8. Mr. William Pengelly, "On Kent's Cavern, Torquay."

SAT.....Royal Inst., 3. Professor Westmacott, R.A., "On Art Education and how works of Art should be viewed."
Royal Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 2nd August, 1865.

[illegible]. Metropolitan Toll Bridges Bill, and Chelsea Bridge Toll Abolition Bill—Special Report.
[illegible]. Waterworks Bill—Special Report.
[illegible]. Africa (Western Coast)—Report and Evidence.
[illegible]. Caledonian Canal—Sixtieth Report of Commissioners.
[illegible]. Gas Companies (Metropolis)—Accounts.
[illegible]. Russian Epidemic.
442 (I). Poor Rates and Pauperism—Return.
[illegible]. East India (Badshapore Case)—Return.
[illegible]. Electors—Return.
[illegible]. Bishop of Capetown—Return.
[illegible]. Constabulary (Ireland)—Return.
[illegible]. Sugar Return.
[illegible]. Public Accounts—Return.
[illegible]. Electors, &c. (London)—Return.
[illegible]. Pier and Loan Funds (Ireland)—Accounts.

SESSION 1864.

507 (B). Poor Rates and Pauperism—Return (B).
507 (C). Poor Rates and Pauperism—Return (C).

Delivered on 3rd August, 1865.

Railways in India.
Customs—Ninth Report of Commissioners.
Civil Service Commissioners—Tenth Report.

Delivered on 7th August, 1865.

403. Education—Report and Evidence.
437. Naval Prize Money, &c.—Account.
442 (A I). Poor Rates and Pauperism (April 1864 and 1865)—Return.
449. Highways Act—Return.
485. Twenty-ninth Canon—Correspondence.
487. Cape Town and Dock Railway—Correspondence.

SESSION 1864.

528. Prince Edward's Island—Return.

Delivered on 12th August, 1865.

Poor Law Board—Seventeenth Annual Report.

Delivered on 14th August, 1865.

349. Finance Accounts—Parts I. to VII.
375. Revenue (Ireland)—Return.
383. Baths and Washhouses Acts—Return.
399. Thames River—Report from Committee.
490. Banks of Issue—Return.

SESSION 1864.

507 (B I). Poor Rates and Pauperism—Return.

Delivered on 17th August, 1865.

330. Taxation of Ireland—Report and Evidence.
420. Standing Orders of the House of Commons.
Colonial Possessions—Reports (Part II).

Delivered on 21st August, 1865.

266 (III). Oaths and Declarations—Further Return.
293. East India (Troops and Police)—Return.
361. Industrial and Provident Societies—Return.
413. Public Accounts—Report from Committee.
422. Steam Vessels—Return.
463. Army (Manufacturing Establishments)—Return.

Delivered on 24th August, 1865.

Public General Acts—Table of.

Delivered on 25th August, 1865.

342. East India (Remunerative Works)—Abstract Statement.
343. East India (Canals).
390 (I). Open Spaces (Metropolis)—Index to Reports.
421. Printed Papers—Return.
425. East India (Army)—Return.
462. Enfield Rifles—Return.
465. Navy (Dockyard Accounts)—Report.
465 (I). Navy (Dockyard Accounts)—Report.

Delivered on 2nd September, 1865.

52 (VII). Trade and Navigation Accounts (31st July, 1865).
442 (A II). Poor Rates and Pauperism—Return (A), June, 1864-65.

Delivered on 5th September, 1865.

402. Tenure and Improvement of Land (Ireland)—Report, Evidence, &c.
476. Income Tax (Abatement)—Return.

Delivered on 11th September, 1865.

357. Postal Service (Ireland)—Returns.
410. Friendly Societies—Report of Registrar.
459. Rifled Guns—Return.

Delivered on 20th September, 1865.

419. Health of the Navy—Statistical Report.
442 (A III). Poor Rates and Pauperism—Return (A), July, 1864-65.
464. River Shannon—Lords Report.

Delivered on 27th September, 1865.

Inland Revenue—Ninth Report of Commissioners.
Children's Employment Commission (1862)—Fourth Report of Commissioners.

Delivered on 30th September, 1865.

52 (VIII). Trade and Navigation Accounts (31st August, 1865).
469. Income and Property Tax—Return.

Delivered on 7th October, 1865.

414. Dogs (Metropolis)—Return.
460. Canada (Transport of Troops)—Return.
488. Natal Railways—Correspondence.

Delivered on 14th October, 1865.

481. Public Schools Bill—Lords Report.

Delivered on 20th October, 1865.

442 (A IV). Poor Rates and Pauperism.

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507 (C I). Poor Rates and Pauperism—Return (A), August, 1864-65.

Delivered on 2nd November, 1865.

52 (IX). Trade and Navigation Accounts (30th September, 1865).
316. Import and Export Duties—Return.

Delivered on 10th November, 1865.

412 (I). Africa (Western Coast)—Index to Report, &c.

SESSION 1864.

507 (E). Poor Rates and Pauperism.

Delivered on 20th November, 1865.

456. Railways—Return.
474. Spirits (Scotland)—Return.

Delivered on 25th November, 1865.

439. Savings Banks—Return.
442 (A V). Poor Rates and Pauperism—Return (A), September, 1864-65.
455. Union Valuation Lists—Return.
471. Newspapers—Return.
492. Bristol Episcopal Residence—Papers.

Delivered on 2nd December, 1865.

52 (X). Trade and Navigation Accounts (31st October, 1865).

Delivered on 7th December, 1865.

403 (I). Education—Index to Report and Evidence.
441. Woods, Forests, and Land Revenues—Forty-third Report of the Commissioners.

Delivered on 12th December, 1865.

360. Lighthouses, &c.—Report to Board of Trade.
442 (B). Poor Rates and Pauperism—Return (B), Paupers relieved on 1st July, 1865.

Delivered on 27th December, 1865.

442 (A VI). Poor Rates and Pauperism—Return (A).
467. Endowed Grammar Schools—Return.

Delivered on 1st January, 1866.

52 (XI). Trade and Navigation Accounts (30th November, 1865).

Delivered on 6th January, 1866.

404. Scurvy in Merchant Ships.

Delivered on 11th January, 1866.

243. Pilotage—Return.

Delivered on 29th January, 1866.

442 (A VII). Poor Rates and Pauperism—Return (A).
479. Local Government Act (1858)—Seventh Annual Report.
489. Post Office Savings Bank—Return.

Delivered on 30th January, 1866.

Trade and Navigation of the United Kingdom (1864)—Annual Statement.

Delivered on 7th February, 1866.

Jamaica—Papers relative to the Disturbances (Part I).
Jamaica—Further Papers (Part II).
Jamaica—Papers relative to the Affairs of.
North America, No. 1 (1866)—Correspondence respecting the "Shenandoah."
Brazil—Papers respecting the renewal of Diplomatic Relations.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation.
Coal—Reports from Her Majesty's Secretaries of Embassy and Legation.

Delivered on 9th February, 1866.

Post Office—Eleventh Report of the Postmaster General.
Capital Punishment—Report of the Commissioners, Evidence, &c.
Sea Fisheries—Report of the Commissioners, Vol. I.
Douro Wine Trade—Correspondence.
Austria—Treaty of Commerce.

Session 1865.

433. Metropolitan Workhouses—Return.

Patents.

From Commissioners of Patents' Journal, February 9th.

Grants of Provisional Protection.

Boats—232—W. K. Hall.
Boats, detachable eye for launching—285—W. Clark.
Boats, lowering—259—E. Ambrose and W. Braddon.
Boilers, &c., heating water for suppling—218—T. Prideaux.
Bricks, pressing—112—H. A. Dufrene.
Bricks, waterproof—40 E. Taylor.
Engines—44—W. Winter.
Fatty matters, distilling the grease of—297—C. Doughty.
Fire-arms, breech-loading—283—J. Snider, jun.
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Fire-proof floors—224—R. Moreland, jun.
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Iron and wood, drilling, &c.—2820—J. Curtis.
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Ladies' dresses—206—W. C. Jay.
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Leather, substitute for—4—M. Lohren.
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Metals, moulds for casting—196—W. Thomas, jun.
Metal tubes, &c., casting—172—W. Sumner.
Mirrors, centres for swinging—245—J. Soutter, sen.
Moulds, drying—231—M. H. Lishman and E. Chambers.
Motive power, electro-magnetic engines for obtaining—311—W. Darlow.
Paper—2726—J. Wright.
Potatoes, cooking—106—P. L. Charon.
Quartz, &c., crushing—275—A. B. Childs.
Railway and other carriages, axle-boxes of—253—F. Wise.
Railway and other lamps—307—C. E. Giajola.
Railways—287—J. Berrie.
Reaping and mowing machines—204—J. H. Johnson.
Screw apparatus, differential—273—R. A. Brooman.
Sewing machines—295—A. Smith.
Sewing machines, feed motion for—247—W. Winter.
Ships, closing the hatchways, &c., of—219—C. E. H. C. Healey.
Soils, preparing—240—T. Spencer.
Spindles, grinding or glazing—293—S. B. Ardrey, S. Beckett, and W. Smith.
Spinning, preparing fibrous substances for—230—W. Dore, J. Tapley, and J. Cordwell.
Stage illusions, producing—184—G. Tanner and G. Parkes.
Steam boilers—148—R. Cherry, E. Crossley, and W. Bower.
Steam boilers—194—W. K. Hall.
Steam boilers—226—J. Howard and E. T. Bousfield.
Steam boilers, preventing incrustation in—228—M. Silvester.
Steam boilers, vertical—166—D. Adamson.
Steam engines—281—J. Orr.
Steam engines, generator for—214—W. E. Gedge.
Steam engines, lubricating—167—H. Ashworth.
Straps or driving belts, splicing—249—G. Dyson.
Straw, &c., washing—143—J. Samwells and S. Nye.
Weaving, looms for—234—D. Lord, T. Lancaster, and R. Bennett.
Weaving, looms for—303—R. Clayton, J. Raper, J. Goulding, and W. Howarth.
Woven fabrics, folding, &c., of—77—J., C., and H. Sampson, and A. Lockwood.
Yarn, spinning—178—A. V. Newton.
Yarns or warps to be woven, preparing—271—S. Cook and W. H. Hacking.

Invention with Complete Specification Filed.

Woven fabrics, cutting, &c.—351—A. Mahieux.

Patents Sealed.

2080. W. T. Cole, H. S. Swift, and A. Soares.	2150. J. B. Austin.
2095. H. Woodward.	2448. W. Unwin.
2096. R. A. W. Westley.	2636. W. Mather.
2099. W. F. Henson.	2748. A. V. Newton.
2100. J. T. Lockey.	2772. W. E. Newton.
2102. J. Gamgee.	2899. H. C. Carden.
2103. R. C. Lilly & J. Sunderland.	2980. J. B. Edge and E. Hird.
2121. S. Phillips and J. Groves.	3136. T. L. Nicklin.
2134. J. L. Clark.	3205. M. Klotz.
	3300. H. A. Bonneville.

From Commissioners of Patents' Journal, February 13th.

Patents Sealed.

2111. J. Billings.	2255. A. V. Newton.
2114. J. Ingham and J. Culpan.	2366. W. Clark.
2125. E. Rimmel.	2428. C. and T. White.
2127. A. V. Newton.	2439. A. V. Newton.
2137. R. A. Brooman.	2947. M. Caton and H. Holden.
2138. G. Howard.	3022. W. E. Newton.
2147. R. A. Brooman.	3024. A. V. Newton.
2151. W. Soper.	3197. W. J. Murphy.
2215. G. Robinson.	

Patents on which the Stamp Duty of £50 has been Paid.

342. J. Cameron.	368. A. Corneau.
23. H. Jones.	375. W. Symington.
358. J. Goucher.	396. S. Whitaker.
367. W. Whitaker & W. Tongue.	

Patents on which the Stamp Duty of £100 has been Paid.

383. J. Evans.	422. J. T. Jones.
356. J. B. Redman.	401. G., G. W., and J. Betjemann.
357. A. Clark.	

Registered Designs.

A Potter's Kiln Brick—February 1—4769—Messrs. Proctor and Lunt, Williamson-street, Tunstall.
Gas or Air Tight Flap—February 1—4770—J. N. Smith, 2, Camden-place, South street, Greenwich.
Silent Reclining Perambulator—February 2—4771—A. R. Hardisty, Liverpool.
Call Bell—February 2—4772—W. Tonks and Son, Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 23, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

February 28.—A Report by the Secretary on the results of the Art-Workmanship Competition, from its commencement, will be read, and a discussion taken upon it. The competitors and Art-workmen generally are invited to attend.

March 7.—"On the late Anglo-French Exhibition, with a Proposal for the formation of an Anglo-French Association." By Robert Coningsby, Esq.

Cantor Lectures.

The concluding lecture of the course, on "Submarine Telegraphy," by Fleeming Jenkin, Esq., F.R.S., will be delivered as follows:—

Lecture V.—Monday, February 26.

Electrical Tests.—(*Continued.*)

1. *Testing short lengths;* use of statical electricity Thomson's Electrometers.
2. *Testing joints.*—Bright and Clark's test by accumulation; testing from outside with battery; test from outside by electrometer.
3. *Induction tests.*—(*a.*) Meaning of "charge," "capacity," and "inductive capacity." (*b.*) Object of diminishing the capacity of a cable. (*c.*) Methods of measuring the capacity of a cable. (*d.*) Capacity per knot of various cables. (*e.*) Specific inductive capacity of various materials; effects of temperature and pressure.
4. *Tests to detect faults.*—(*a.*) Fault of continuity with copper, bare or insulated. (*b.*) Defective insulation.
5. *Tests to determine the position of faults.*—(*a.*) Insulated fault of continuity. (*b.*) Dead earth. (*c.*) Partial loss of insulation in a cable with one conductor; resistance of fault; polarization; earth currents. (*d.*) Partial loss of insulation in a cable with two or more conductors.

The lectures commence each evening at Eight o'clock.

National Portrait Exhibition, 1866.

Season Tickets for this Exhibition are now ready, and may be had at the Society of Arts, on application to the Financial Officer, price £1.

Paris Universal Exhibition of 1867.

Forms of application for space, and copies of the regulations, may be had on application to the Secretary of the Society of Arts, and should be applied for immediately.

Although the 28th February, 1866, has been fixed as the last day for receiving demands for space, intending Exhibitors are requested not to delay forwarding such demands, but to send them as soon as possible.

Proceedings of the Society.

Cantor Lectures.

"On Submarine Telegraphy." By Fleeming Jenkin, Esq., C.E., F.R.S.

Lecture IV. Monday, February 19.

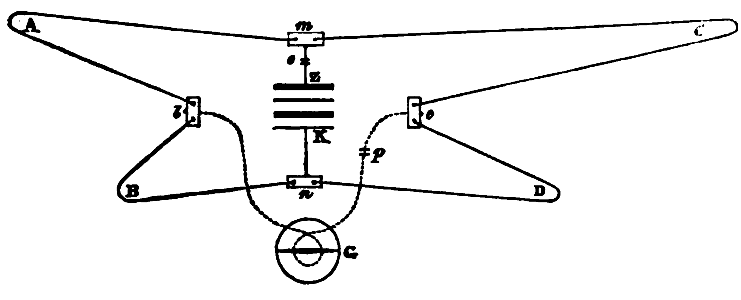
Electrical Tests.

1. *Terms Used.*—In order to understand electrical tests, it is chiefly necessary to have a definite conception of what is meant by electrical resistance. When the two end plates of a voltaic battery are joined by a wire or other conductor, an electric current flows through the conductor, the presence of the current being shown by the power the wire has acquired of deflecting a magnet in its neighbourhood. The magnitude of a current is simply proportionate to the force with which it acts on a magnet *(cæteris paribus):* thus, a magnet hung inside a coil of insulated wire, is called a galvanometer, or current measurer, since it may be said to measure the current by the deflection of the magnet. When this deflection is small, as was the case with the instruments exhibited, in which the deflection of the magnet was indicated by the motion of a reflected ray of light, the deviations of that ray of light from its normal position may be considered as true relative measurements of the current producing that deviation. The battery may be looked upon as a constant source of power, and the conductor as a kind of pipe conveying the current of electricity. The magnitude of the current depends, with a given battery, on what is called the resistance of the circuit. If the wire be small and long, the current will be feeble, and the resistance of the circuit is said to be great. If the wire be short and thick, the resistance will be small. The resistance of a conductor is the property in virtue of which it prevents a given battery from producing more than a given current, precisely as the resistance of a pipe to the passage of water might be defined as the property in virtue of which it prevents the passage of more than a certain current of water with a given head. The resistance of conductors varies, not only with the dimensions but with the materials of which the conductor is composed; and this resistance can be measured, *i.e.*, compared with the resistance of any other given wire, in virtue of Ohm's law, viz., that the current through a given circuit is inversely proportional to the resistance, and directly proportional to the force producing it. That force is constant with a given battery, so that if we find our current halved by the introduction of a certain wire into a circuit, we may be sure that the resistance of the circuit is doubled; but in making that calculation we must take into account the resistance, not only of the wire, but of the measuring instrument and of the battery; when this is done the old distinctions of quantity and intensity currents will be found unnecessary, and indeed false, since a current has but one mensurable property, viz., its magnitude or strength. A current existing in a circuit which already includes a considerable resistance is what used to be called an "intensity current;" a current in a circuit which includes no considerable resistance is what used to be called a "quantity current." The first is little affected by the addition of a resistance which may almost wholly annihilate the second. A convenient method of measuring the resistance of a battery, due to Professor Thomson, is given in Appendix II. By the simple application of Ohm's law we might compare the resistances of two wires by observing the relative effect which they produce in a given circuit; but this is inconvenient, and hardly admits of much accuracy. The battery may vary, both as to force and resistance, during the two tests, and even if constant, the accuracy of the observation will be limited by the accuracy with which a deflection can be observed. More accurate practical

tests have, therefore, been invented to measure and compare the resistance of conductors.

Tests of Conductor.—Every test used is a test of resistance, and all depend on Ohm's law above cited; the instruments may be much varied, but the most convenient is probably that known as "Wheatstone's balance, or differential measurer." Let four wires be joined with a galvanometer and battery, as in Fig. 1; then, if A, B, C, and D represent the resistances of the four wires, no current whatever will

FIG. 1.



pass through the most sensitive galvanometer when $\frac{A}{B} = \frac{C}{D}$, but if the ratio $\frac{A}{B}$ be a little larger than $\frac{C}{D}$ a current will pass through the galvanometer in one direction; if $\frac{A}{B}$ be smaller than $\frac{C}{D}$, the current will be in the opposite direction. An explanation of this fact will be given in the ensuing Lecture. Four wires thus arranged allow us to measure the resistance of any one of them which is not known, in terms of the three others: if A and B are equal, we may try how great a length of D is exactly equal in resistance to C, a selected standard, and this is precisely the test adopted to choose copper of small resistance or good conducting power. C is, say, 100 inches of copper wire, known to be good. Then the observer tries how great a length of copper wire from a new hank must be inserted at D to bring the galvanometer to zero, or no deflection. If this length be 105 inches the new hank is five per cent. better in quality than the standard; if the length be 95 inches, then the new hank is five per cent. worse in quality than the standard. But this is not all: if we desire to measure a coil of wire having ten times the resistance of C, we may make B exactly ten times A, and then when we have adjusted the length of the wire D, so that the galvanometer is at zero, we may be sure that the resistance of D is ten times C. Hitherto we have spoken of comparing two random wires, but it will clearly be convenient to have some common term of comparison, such as the foot for length, or the pound for weight. With this view the resistance of a certain piece of wire is chosen as the unit, and when other wires are measured, instead of being always directly compared, they are each compared with the unit, and are said to have each so many units of resistance. Several units have been proposed; the lecturer uses that known as the British Association unit, sometimes called the "Ohm." When a unit has been chosen, whether for length, weight, or electrical resistance, it will always be found convenient to have multiples of the unit for measuring large quantities, and fractions of the unit for comparison with small quantities. With this object separate pieces of wire, equal to 1, 2, 3,....to 1,000, or even 10,000 units, are prepared in cases, and conveniently arranged so that any resistance required can be selected and inserted in the required circuit. These cases of graduated wires are called sets of resistance coils, and are variously arranged by the different makers. Mr. C. W. Siemens and Messrs. Elliott, Brothers, both make sets of British Association coils. If, when possessed of such a set of coils, we receive a wire of which we do not know the resistance, we may arrange a Wheatstone's balance in which two equal coils are connected as at A and B; the new wire at D and the set of coils at C. We then find by trial the number of units required to bring the galvanometer to zero. If we find D too small to be conveniently measured thus, we may choose two coils equal to 1 and 100 for B and A. When the galvanometer is at rest on completing the circuit the resistance of D will be the hundredth part of the coils included at C. Similarly, if D be large we may make the coil A 1, and B 100; then the resistance of D will be 100 times that of the coils required at C to bring the galvanometer to zero. A still greater degree of precision in comparing C and D will be obtained if part of the wire between A and B be a uniform wire laid along a measured scale, and if the point *l*, to which the galvanometer wire is attached, be made moveable along this wire, the resistance of which must be known as compared with the other parts of A and B. Now, if A, B, C, and D are as nearly balanced as they can be by the addition and subtraction of units at C, a still more perfect balance (indicated by the absence of deflection in the galvanometer) may be obtained by shifting *l* a little; then, if its position be observed, giving the exact ratio between A and B the exact value of D can be found in terms of the unit used at C by a simple rule of three sum. In fact, every change that the rule of three is susceptible of, can be worked out effectually by the above arrangement, and measurements can be made without an error of one part in 100,000. Experiments were shown illustrating the above statements.

It will now be seen that we have the means of comparing the resistance of wires very accurately, and of comparing all wires with a common unit; but it is also convenient to be able to calculate beforehand what the resistance of a given wire will be or ought to be, and for this purpose it will be sufficient to know the resistance of some one wire of known dimensions of each material; the resistance of all other wires of that material can then be simply calculated, since that resistance is directly proportional to the length, and inversely proportional to the section, of the wire. Table IX. is a table of "specific resistances," defined in various ways. The first column contains the numbers which will probably be found most useful. The following is an example of its use:—let it be required to know the resistance at 0° of a conductor of pure hard copper, weighing 400lbs. per knot. This is equivalent to 460 grains per foot. The resistance of a wire weighing one grain per foot is 0·2106; therefore the resistance of a foot of a wire weighing 460 grains will be $\frac{0{\cdot}2106}{460}$, but the resistance of one knot will be 6,087 times that of one foot, hence the resistance required will be $\frac{6087 \times 0{\cdot}2106}{460} = 2{\cdot}79$ units. If

TABLE IX.

Specific resistance in B.A. units of metals and alloys at 0° Centigrade, from Dr. Matthiessen's experiments.

Name of Metals.	Resistance of a wire one foot long, weighing one grain.	Resistance of a wire one metre long, weighing one gramme.	Resistance of a wire one foot long, 1-1000th inch in diameter.	Resistance of a wire one metre long, one millimetre in diameter.	Approximate per centage of variation in resistance per degree of temperature at 20°
Silver annealed	0·2214	0·1544	9·936	0·01937	0·377
„ hard drawn......	0·2421	0·1689	9·151	0·02103	..
Copper annealed	0·2064	0·1440	9·718	0·02057	0·388
„ hard drawn ...	0·2106	0·1469	9·940	0·02104	...
Gold annealed	0·5849	0·4080	12·52	0·02650	0·365
„ hard drawn ...	0·5950	0·4150	12·74	0·02697	...
Aluminium annealed	0·06822	0·05759	17·72	0·03751	...
Zinc pressed	0·5710	0·3983	32·22	0·07244	0·365
Platinum annealed ...	3·536	2·464	55·09	0·1166	...
Iron annealed	1·2425	0·7522	59·10	0·1251	...
Nickel annealed........	1·0785	0·8666	75·78	0·1604	...
Tin pressed	1·317	0·9184	80·36	0·1701	0·365
Lead pressed	3·236	2·257	119·39	0·2527	0·387
Antimony pressed......	3·324	2·3295	216·0	0·4571	0·389
Bismuth pressed	5·054	3·525	798·0	1·689	0·354
Mercury liquid	18·740	13·071	600·0	1·270	0·072
*Platinum Silver, alloy hard or annealed	4·243	2·959	148·35	0·3140	0·031
†German Silver, hard or annealed	2·652	1·850	127·32	0·2695	0·044
‡Gold Silver alloy, hard or annealed	2·391	1·668	66·10	0·1399	0·065

t the diameter of the wire be given instead of its weigh- per knot, the calculation is still simpler, and the con stant for English measures would be taken from the third column of the table. Thus the resistance at 0° of a knot of pure hard-drawn copper wire 0·1 in. diameter would be $\frac{6087 \times 9 \cdot 94}{100^2} = 6 \cdot 05$. It will be seen that annealing wires materially alters their resistance, though it leaves their chemical composition quite unaltered. A rise in temperature increases the resistance of all the metals, and Dr. Matthiessen discovered that for all pure metals the increase of resistance between 0° and 100° C is sensibly the same except for iron. Table X. gives the formula and constants by which the resistance of any wire between those limits may be calculated. Roughly, all pure metals increase from 0·37 to 0·39 per cent. for each degree of temperature within the limits usually occurring in rooms. Table XI. gives the specific resistance of the more important metals at various temperatures. The resistance of most alloys is very much greater than the mean of the metals composing them; indeed, a singularly small mixture of a foreign metal reduces the resistance of the pure metals very largely; so much so, that in commerce copper cannot be obtained which is equal or even nearly equal to that of pure copper. The figures and constants given in the above tables are only applicable with accuracy to pure metals. In old cables the quality sometimes was very bad, but lately the resistance of cable copper has usually been only about 10 per cent. more than that of pure copper. Table XII. gives the resistance of the copper of various cables at 24° centigrade, also the specific resistance at the same temperature. Although alloys cannot be used for cables, owing to their high resistance, they are very useful in the construction of resistance coils, since not only are coils of great resistance made of small bulk by their use, but these coils are much less altered by a change of temperature than if made of simple metals. The tables contain the resistances of the chief alloys now in use with the co-efficients for temperature

* The alloy used for B.A. resistance units, 2 parts platinum, 1 part silver by weight.
† The alloy commonly used for resistance coils.
‡ 2 parts gold, 1 part silver by weight.

TABLE X.

Constants, for metals or alloys, by which to calculate the resistance R at temperature t from the resistance r at zero:—$R = r\,(1 + a\,t \pm b\,t^2)$.

	a.		b.
*Pure metals......	0·003824	+	0·00000126
Mercury..........	0·0007485	−	0·000000398
German silver	0·0004433	+	0·000000152
Platinum silver....	0·00031	..	..
Gold silver	0·0006999	−	0·000000062

TABLE XI.

Resistance in B A units of wires one foot long weighing one grain.

Temperature Centigrade.	Soft copper.	Hard copper.	German silver.†	Platinum silver.‡
0	0·2064	0·2106	10·61	16·97
5	0·2102	0·2147	10·628	17·00
10	0·2144	0·2188	10·647	17·02
11	0·2153	0·2197	..	..
12	0·2161	0·2205	..	..
13	0·2170	0·2214	..	..
14	0·2178	0·2222	..	..
15	0·2186	0·2231	10·665	17·05
16	0·2194	0·2239	..	..
17	0·2203	0·2248	..	..
18	0·2211	0·2256	..	..
19	0·2220	0·2265	..	..
20	0·2228	0·2272	10·682	17·08
21	0·2237	0·2283	..	..
22	0·2242	0·2288	..	..
23	0·2253	0·2299	..	..
24	0·2262	0·2308	..	..
25	0·2271	0·2317	10·702	17·10
26	0·2279	0·2325	..	..
27	0·2287	0·2334	..	..
28	0·2296	0·2343	..	..
29	0·2305	0·2352	..	..
30	0·2313	0·2360	10·720	17·13
31	0·2322	0·2369	..	..
32	0·2328	0·2375	..	..
33	0·2340	0·2388	..	..
34	0·2348	0·2396	..	..
35	0·2357	0·2405	10·739	17·15
36	0·2365	0·2413	..	..
37	0·2376	0·2424	..	..
38	0·2383	0·2432	..	..
39	0·2391	0·2440	..	..
40	0·2400	0·2449	10·757	17·18

TABLE XII.

Resistance per knot and specific resistance in B A units of conductors and insulators of various cables at 24° C.

Name of Cable.	Resistance per knot of conductor at 24° C.	Specific resistance of foot grain at 24° C.	Resistance per knot of insulator at 24° C after one minute's electrification.	Specific resistance of insulator, or resistance of one foot cube, at 24° C, after one minute's electrification.
Red Sea	7·94	·2700	28×10^6 to 38×10^6	$0 \cdot 875 \times 10^{12}$ to $1 \cdot 187 \times 10^{12}$
Malta-Alexandria, mean	3·49	·2637	115×10^6	4.06×10^{12}
Persian Gulf, mean ...	6·284	·2469	193 „ 10^6	5·910 „ 10^{12}
2nd Atlantic, mean...	4·272	·2421	349 „ 10^6	11·22 „ 10^{12}
Hooper's Persian Gulf core, mean	...	...	8000 „ 10^6	245 „ 10^{12}

* Approximate or mean formula.
† Calculated from spec. gravity 8·47.
‡ Calculated from spec. gravity 12·0. (Approximate values only.)

corrections. There are many points of great practical importance in measuring the resistance of conductors, which cannot be here fully treated of. Thus all resistance coils should be wound double so that the current may pass both ways round the coil equally; this prevents self-induction—a disturbing element. Care must generally be taken in using the Wheatstone balance to connect first the battery at o (fig. 1), and then the galvanometer at p. The battery must be left connected for the shortest possible time, to avoid heating the wires; special precautions must be taken to avoid resistances at connexions, which are often considerable. The resistance of the wires composing the balance should not differ too greatly from that to be measured; short wire galvanometers answer best for short wires; long wire galvanometers for long wires; one cell of large surface generally gives better results than large batteries; the temperature of the wire to be measured, and that of the resistance coils should be accurately observed. These and many other points could only be fully developed in a treatise on testing. Practically, the copper of a cable is tested before it is used, to ascertain whether its quality is equal to that specified; when a knot of wire is covered it is again tested for resistance, to ensure that the proper quantity and quality of wire has been used; finally, after the cable is covered the resistance test serves to check the length of the cable in circuit, to ensure that the conductor is at no point interrupted, and that the temperature in the tank is not higher than it should be.

3. *Tests of Insulator.*—A material is said to insulate well if it offers great resistance to the passage of a current of electricity. The word resistance is here used precisely in the sense in which it was applied to conductors; conductors and insulators both resist the passage of a current, the former allowing a considerable current to be produced by a small battery, the latter allowing but a feeble current to be produced by a powerful battery. The object of surrounding a conductor with a good insulator is to prevent any serious proportion of the current from being diverted to the sea or earth near the conductor; the insulator acts the part of the pipe directing and containing the current; the copper acts more nearly the part of the vacant space, allowing the current to pass, and retarding it only by friction. A pipe to contain water can be made so that it shall not leak, but no material known, except dry air, will perfectly contain electricity; some leakage, indicated by a current, always occurs; and the simplest test of the soundness of the insulator is to connect one end of the conductor A (Fig. 2.) with one pole of a battery, Z, the other

FIG. 2.

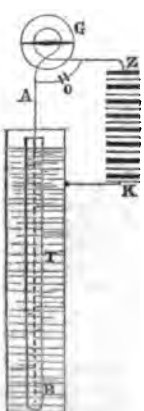
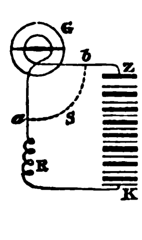


FIG. 3.



pole of which is joined to the water surrounding the insulated wire in the tank T (Fig. 2). If a galvanometer, G, be placed between the battery and the conductor, and the other end of the conductor insulated, any current producing a deflection in the galvanometer must p[ass] through the sheath from the copper to the water; su[ch] current is often called a leakage. With a battery of kn[own] strength, and a galvanometer with which the obser[ver] is already well acquainted, the greater or less deflec[tion] of the galvanometer needle will often be sufficient [to] show whether this leakage is so excessive as to in[di]cate a flaw in the insulator connecting the w[ater] and the copper; this was the earliest insula[tion] test; but it is clearly far from giving a meas[ure]ment of the accurate kind which has been descri[bed] for conductors. No two galvanometers are al[ike] nor is any one instrument constant in its ind[ica]tions; moreover an instrument of suitable delicacy [for] one length of insulated wire is unsuitable for anoth[er;] the test is, therefore, a very rude and imperfect one; [but] a slight modification allows us to use it for the pur[pose] of expressing with some accuracy the resistance of [the] insulator in the same units as those used for the condu[ctor.] Immediately after observing the deflection with the [con]nections in Fig. 2, remove the insulated wire A B, [and] join the galvanometer and battery, as in Fig. 3, inser[ting] a set of resistance coils at R, and joining a b by a s[hunt] coil S, with a resistance bearing a certain definite ra[tio to] that of the galvanometer, for instance, with $\frac{1}{999}$ part of that resistance. The current from the ba[ttery] will, at a and b, divide itself between the two bra[nches] S and G, in the ratio of 999 to 1; now adjust the [resis]tance coils R until the same deflection be obtain[ed as] before; then, if we call x the whole resistance o[f the] circuit when connected as in Fig. 3, the resistance o[f the] circuit in Fig. 2, which is sensibly equal to that o[f the] insulating sheath, will be 1000 x, since the curre[nt in] the first case must have been 1000 times less than i[n the] second case, when only $\frac{1}{1000}$th part of the current f[lowed] through the galvanometer. It will be obvious th[at we] might use for the first connection a battery of 100 [times] greater electromotive force than is used in the s[econd] case; then the resistance of the insulator wou[ld be] 100,000 x. In many cases x may be take[n as] equal to R, neglecting the other parts of the c[ircuit.] This can always be safely done if R be large, S small, and KZ be a large single cell; but it is not di[fficult] to calculate the whole resistance x, when the above [con]ditions cannot be obtained. The resistance betw[een a] and b is made up of two wires joined in what is [called] multiple arc; call S the one resistance, G the other;

the resistance of the two is $\dfrac{1}{\dfrac{1}{G} + \dfrac{1}{S}}$;

obtain the total resistance of the circuit, add the resista[nce] of the battery and the resistance R. It will be furt[her] obvious that the resistance R need not be adjusted so [as] to give exactly the deflection obtained with the connex[ions] in Fig. 2. If any convenient deflection be observed w[ith] a given resistance R_1, the resistance R is given by a si[m]ple proportion. Moreover, it is unnecessary to repeat [the] test of Fig. 3 every time an insulation test is made; [we] may often assume that unless some accident has happe[ned] to the instrument it will remain constant for some ho[urs;] in that case, having found the resistance which cor[res]ponds to one deflection (Fig. 2), the resistance cor[res]ponding to other deflections results from a simple [pro]portion. It is assumed, of course, that a galvanom[eter] is used in which the deflections are proportional to [the] magnitude of the current, as is the case with reflect[ing] galvanometers. In making the test (Fig. 2) care m[ust] be taken to prevent the first shock of the current f[rom] passing through the galvanometer; for this purpo[se a] connection of very small resistance may be placed, a[s] at o. This connection must be broken immediately [after] the battery has been applied. The reason why this [pre]caution is necessary will be mentioned in the next lect[ure.] An astatic reflecting galvanometer, with coils round [the] magnets, of the form designed by Professor Thomson, with long fine wire, will be found well adapted for

test; to ensure accuracy care must be taken to make the coil S, frequently called a shunt, of thick wire and of such form as not easily to be heated; to maintain this strand as nearly at the same temperature as the galvanometer coil as may be; to let the battery remain in circuit as short a time as possible; to let the insulated coil remain in the water for such a time as may ensure its being at a known temperature throughout; to practice extreme cleanliness in the keys used; to cut the ends of the wires tested to avoid loss by surface conduction. When these and other precautions have been taken, tolerably uniform results can be obtained, but they do not approach in accuracy those obtained in measuring conductors. For instance, the accuracy cannot be greater than that with which a deflection can be observed, or say one part in 200. In long cables the resistance across the insulator can be measured with the Wheatstone balance, by using the insulator as one of the four conductors A B C or D (Fig. 1). It will be seen that as the length of an insulated wire increases, the resistance to conduction across the insulator decreases, for there is continually a larger and larger area of material to conduct the current, and the distance across the insulator from the copper to the water remains the same. Thus the insulating sheath of 1,000 miles of Malta-Alexandria cable is nearly equal in conducting power (or resistance) to a sheet of gutta-percha one acre in area and one-tenth of an inch in thickness, separating a copper plate from a sheet of water. The resistance at 24° C of this insulating sheet of enormous section and very small thickness would be about 115,000 BA units; the resistance at 24° C of the long copper conductor would be about 3,490 BA units. These resistances are not so dissimilar as to be incomparable even directly by the Wheatstone balance; resistance coils of German silver of 10,000 units, or even 100,000 units, nearly equal to the above insulation resistance, as it is sometimes called, are not uncommon. It will now be seen how it is that bodies of which the specific properties differ so enormously as copper and gutta-percha, can yet be directly compared. The specific resistance of insulators can be given just as the specific resistance of conductors has been given, but it is customary to use a different definition, and call the specific resistance of an insulator the resistance of a foot cube electrified on the two opposite faces. Table XII. gives the resistance of the gutta-percha of the most important cables per knot, and their specific resistance as above defined. The following equation allows the resistance R of a core of known dimensions to be calculated from its specific resistance S:—

$$(5.)\quad R = S \frac{\log._\epsilon \frac{D}{d}}{2\pi L}$$

here $\log._\epsilon \frac{D}{d}$ = the hyperbolic log. of the ratio of the diameter of the insulator to that of the conductor (given in Table III. above); $\pi = 3{\cdot}1416$, and L = the length of the core in feet. To convert the specific resistance, as above defined, into that of a wire or rod one foot long, weighing one grain, the figures given in the table for gutta percha must be multiplied by about 443,000. The fashion observed of writing 10^{12}, or ten at the power twelve, simply means that the number given must be multiplied by 1,000,000,000,000, or by one followed by twelve zeros. This plan of writing large numbers saves space, and is convenient in multiplication for those acquainted with the simpler properties of exponents. Hitherto that quality only has been spoken of in which insulators resemble conductors, viz., that of possessing a measurable resistance; but there are marked differences in the behaviour of an insulator and a conductor when a current is passing through them. The resistance of the conductor, if prevented from heating, remains perfectly constant; but the resistance of an insulator is apparently much greater during the second minute after the battery is applied than during the first; it increases again, but not so much, during the third minute, and continues to increase by smaller and smaller amounts for at least half-an-hour. It will be shown in the final lecture that this apparent change of resistance is probably due to a kind of absorption; but, whatever be the cause of the phenomenon, it entails great inconvenience in testing. When the current is reversed, the apparent resistance falls as low as ever, or lower, and then again increases for half-an-hour. To meet this continual change, due to what is called electrification, tests are always made at definite times, generally one minute after the battery has been applied; but even with this precaution the residual effects of previous electrification are often embarrassing. All insulating substances, except air, present the same phenomenon, but in a greater or less degree. It is very marked, frequently producing a change of 50 per cent. in the apparent resistance of gutta-percha, and its effect is greater in cables which are thickly covered with the insulator. Neither pressure nor change of temperature greatly affect the proportionate effect of electrification. With Mr. Hooper's material, as supplied to the Indian Government, the change produced is extraordinary; at the end of ten minutes the resistance seemed to have increased nearly fourfold, and at the end of about 19 hours the resistance was 23 times greater than at the end of one minute.* This singular property of insulators is one of the chief difficulties to be met in any attempt to obtain strictly accurate measurements. A change of temperature also causes a much greater alteration in insulators than in conductors; and a rise of temperature causes a fall in resistance instead of an increase; thus the specific resistance of gutta-percha is about 20 times as great at freezing point as at 24° centigrade. Gutta-percha, as now supplied, behaves very uniformly in this respect, as is shown by the independent experiments of Mr. Siemens, Messrs. Bright and Clark, and the lecturer. The following equation, due to Messrs. Bright and Clark, will allow the resistance R of any core at a temperature $T + t$ (in degrees centigrade) to be calculated from the resistance r at T° centigrade.

$$(6.)\quad R = r \times 0{\cdot}8878^t.$$

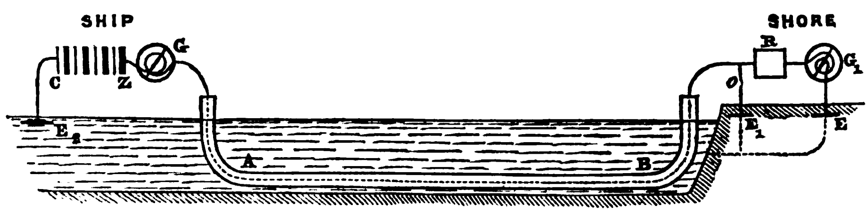
The number 0·8878 is not quite constant, but seems to vary between that figure and 0·9. The effect of temperature on india rubber is not nearly so great, but the lecturer is not in possession of experiments, the whole circumstances of which, including the preparation of the india rubber, are known to him, and he prefers not to give results which might be misapplied and mislead. Pressure improves the insulation resistance of gutta-percha 2·3 per cent. for each 100 lbs. per square inch, according to experiments on the Malta-Alexandria cable, and 2·6 per cent., according to experiments on the Persian Gulf cable. When it is remembered that the pressure in 2000 fathoms is about two tons per square inch, it will be seen that the improvement due to this cause is not to despised. India-rubber behaves differently. Mr. Siemens published some curious experiments in the British Association report for 1863, showing that pure india-rubber slightly fell off in resistance as the pressure increased. No sensible effect on the resistance of gutta-percha has yet been observed, due to the absorption of water. The object of the tests described is first to ensure the use of a proper material, the quality of which may be specified in the contract; secondly, to detect any serious flaw in the outer coating, which would at once be shown by the diminution it would cause in the resistance. The more accurately the resistance of the insulator can be observed and calculated, the more certain we can feel of detecting even the smallest irregularity.

4. *Tests at Sea.*—Whereas tests on land are, in great measure, directed to secure a fit quality of material, the tests at sea should have but one object—the detection of a fault as soon as it occurs, and the determination of its nature and position. Common forms of galvanometer cannot be used at sea, but Professor Thomson's well-known marine galvanometer allows every test hitherto described

* This information was kindly supplied by Mr. Laws.

to be applied as rigorously at sea as on shore. It consists of a very light magnet and mirror, strung on a fine tight fibre, and so perfectly balanced as not to deflect from its normal position relatively to the suspending frame and coils, however they may be inclined in any direction. A powerful magnet, in a fixed position relatively to the suspending frame and coils, directs the suspended magnet, and overcomes the influence of the earth, from which the magnet is still further screened by a thick hollow iron case, which wholly surrounds the coils, except where a glass window allows a ray of light from a lamp to enter and return so as to fall upon a scale after reflection from the mirror. These instruments are made by Mr. White, of Glasgow, and Messrs. Elliott, Brothers, of London, and are now almost exclusively used for tests at sea, which may so far be considered as quite unaffected by the direction of the ship or its motion. Two disturbing agencies are found in the currents induced in the coils of cable as the ship rolls, and the so-called earth currents, depending on the different electric potential or tension of the earth, which may occur between the earth plate on shore, and the connexion with the sea at the ship. These disturbances are readily overcome by the use of sufficiently strong batteries, so that no details or explanation of their action need be given here. It may be granted that on board ship all tests can be accurately made, and it only remains to consider what system shall be followed to ensure immediate detection of a rupture in the copper conductor or an injury to the insulator. Hitherto it has been a common practice to arrange a succession of tests recurring in a constant order at definite intervals of time. During the first 20 minutes of each hour an insulation test may be used; and the simple test (Fig. 2.) of watching that the spot of light in the galvanometer does not quit its proper place on the scale, as it certainly will do the instant any flaw in the insulator allows a connexion between the copper and the water, is probably the best as well as the simplest. During the next 20 minutes the resistance of the copper may be measured, showing that it is unbroken, and indicating the temperature of the bottom. During the last 20 minutes speaking instruments may be connected with the cable, and intelligence given and received; then *da capo*. But this system has great defects. We may wish to send or receive intelligence when it is impossible to do so; the clerk, or clock, or shore may not keep time with the ship, and cause needless alarm or confusion; special emergencies may require special tests, and then the routine plan either prevents these, or causes confusion; but worse, much worse than all this, a fatal injury to the insulation may altogether escape detection during the periods allotted for continuity tests and speaking; it may pass over into the sea, and, when finally discovered, may be some miles from the ship. It would be better to maintain constantly a simple insulation test, and let the shore end remain insulated and unwatched. No fault could then occur in the insulator without being instantly detected; and even a break in the copper, inside the insulator, would be shown by a sudden fall in the leakage, owing to the shorter length of cable which would then be under the action of the test. A simultaneous injury to insulator and conductor would be still more obviously indicated; but such a plan as this would result in voluntarily throwing away the assistance to be derived from intelligent observations on shore, which, it will be seen in the next lecture, may give important assistance in determining the position of a fault when it does occur. To meet this dilemma plans have lately been devised by which an insulation test on the ship and a simultaneous insulation test on shore can be nearly constantly maintained; speaking can be practised at any moment by ship or shore, and even during the transmission of messages the insulation test need not be wholly suspended. The first of these plans, in order of publication if not of conception, is due to Mr. Willoughby Smith. The connections required are shown in fig. 4. C Z is the ship battery; E_2, the ship earth plate, or sea connection; G, the marine galvanometer; A B, the cable, connected at the shore end with a great resistance R, equal to say the insulation resistance of four or five knots of cable. G_1 is a very delicate galvanometer on shore, placed between the resistance R and the earth plate. When these connections are made, a slight deflection on the ship galvanometer, G, will indicate the normal leakage of current through the gutta percha. Almost the full tension of the battery will act on R, and cause a feeble current to pass through this resistance, causing a moderate deflection on G_1. This feeble current will, of course, add to the leakage

Fig. 4.



indicated by G; but if R be equal to the gutta percha of say five knots, and A B be 1,000 knots long, the leakage through R will only add $\frac{1}{200}$ part to the deflection on G, and this may be neglected. A fault of insulation occurring in A B will instantly increase the deflection on G, will lower the tension of the battery acting on R, and so diminish the deflection on G_1. Ship and shore will both be advised of the misfortune. A break of continuity in the copper of A B, without loss of insulation, will diminish the deflection on G, and wholly stop the deflection at G_1 after a little while; thirdly, if the cable breaks altogether, there will be a great increase in the deflection of G, and a total cessation of all deflection on G_1. The shore can, without altering the connections, communicate with the ship by making shorter or longer contacts between the earth and the cable at o. This will cause corresponding deflections on G, but if a resistance be inserted between O and the earth, the deflection on G will be small, so that any considerable fault of insulation would still show on G, by causing a sudden and permanent alteration in the mean deflection even during the signals. The ship can signal to the shore by reversing its battery or by simply increasing and diminishing its tension. The insulation test on board would, the lecturer presumes, be wanting during these signals. It is to be hoped that this or an equivalent system will be adopted in future. It gives perfect freedom from routine, and a greatly-increased chance of detecting any fault the instant it occurs. This is the more important, as faults almost always do occur on board ship, and either in the top flake of the coils or in the machinery. In the next lecture Professor Thomson's plan of attaining the same object will be described.

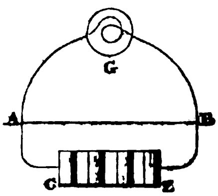
APPENDIX II.

METHOD OF MEASURING THE RESISTANCE OF A BATTERY.

First make the connexions, shown in Fig. 5, where CZ represents the battery to be tested; G, the galvanometer;

and AB, a short wire. The resistance of the conducting wire of the galvanometer must be known, and let it be

FIG. 5.



called equal to a units. Then adjust the resistance of AB so that it shall be equal to one unit, and observe the deflection of the galvanometer. Next break the connexion at AB, and introduce a resistance R, as shown in

FIG. 6.

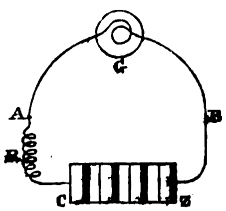


Fig. 6. Adjust this resistance till the deflection is the same as before; let the resistance at R, when thus adjusted, be called b, then the resistance of the battery, or, more strictly, the part of the circuit ACZB, will be equal to $\frac{b}{a}$. If it be not convenient to make AB exactly equal to *one*, any other convenient resistance c may be taken, and then the resistance of the battery will be equal to $\frac{cb}{a}$.

TWELFTH ORDINARY MEETING.

Wednesday, February 21st, 1866; Professor Huxley, F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Betjemann, G. W., 38, Pentonville-road, N.
Creed, H. Herries, Windham Club, St. James's-sq., S.W.
Curtis, John, 111, Westbourne-terrace, W.
Freutel, Henry, 124, Kingsland-road, N.
Hutton, T. Maxwell, Summerhill, Dublin.
Longdon, Frederick, Derby.
Northway, John, 27, Great Tower-street, E.C.
Woods, Miss Elizabeth, 27, Hyde-park-gardens, W.

The following candidates were balloted for, and duly elected members of the Society:—

Beales, R., Congleton.
Davis, James, 2, Harley-road, West Brompton, S.W.
Farnham, Edward, Lordship-road, Stoke Newington, N.
Gale, James, 5, College-terrace, Belsize-park, N.W.
Marsh, John, West-bar, Leeds.
Milnes, Thomas, Zetland-lodge, Southport.
North, Charles Augustus, 1, Earl's-court-road, Kensington, W.
Sefton, Earl of, 53, Grosvenor-place, S.W., and Croxteth-park, Liverpool.
Spong, Rev. James, Mortimer-house, De Beauvoir Town, N.W.
Swindells, George, Bollington, Macclesfield.
Taylor, James, 209, Sloane-street, S.W.
Tanqueray, William Henry, Vine-street, Bloomsbury, W.C.
Torrens, Captain Alfred, Junior United Service Club, S.W.
Wace, John Richard, 45, Baker-street, W.
Ward, Lieut.-Colonel Francis Beckford, Guessens, Welwyn, Herts.

The Paper read was—

ON MODERN LEGISLATION IN REGARD TO THE CONSTRUCTION AND EQUIPMENT OF STEAM SHIPS.

By THOMAS GRAY, Esq., H.M.C.S.

"The Legislation since 1835 has, in many respects, been judicious and beneficial, though in others it has been carried to excess. When so much has been done, errors and omissions have been perhaps unavoidable. . . . . . Your committee are of opinion that the scope of legislation, unless in exceptional cases, ought to extend no further than to secure solidity in the construction and sufficiency in the equipments of the ship; and that various minute regulations, now specially enforced by Act of Parliament, should be watched by the Board of Trade, with a view to remove any reasonable objection of undue official interference with the liberty of action of owners; and to make those regulations conform to the rapidly improving spirit which pervades every branch of scientific and maritime enterprise."—*Select Committee on Merchant Shipping*, 1860.

"I would suggest that it should be optional to shipowners who might choose to do so (not compulsory, but optional to them) to tender their ships to the Board of Trade surveyors, to be examined by them in the same manner as passenger ships are now examined, whether such ships be intended for passengers or not; and that on doing so the Board of Trade surveyors having been satisfied in all respects, these vessels should be registered as such certificated vessels and a certificate be given to them by the Board of Trade, which certificate should be taken as proof that there was no default on the part of the owner unless any actual default could be proved, and that that should be taken as *prima facie* proof that he had done all in his power for the safety of his ship."—*Mr. A. Anderson's Evidence, Select Committee*, 1860. *p.* 288.

"Meddling and muddling."—*Speech of Mr. Henley, President of the Board of Trade.*

INTRODUCTION.

It would be no easy task, and perhaps it would be impossible to determine by fixed rules, the proper limit to which private energy and skill should be left unfettered by legislative enactment, and at which Government interference and official supervision should begin. Whilst, on the one hand, it may be generally admitted that there are many cases in which it may be not only expedient, but proper, that Government should interfere, *e.g.*, to prevent a person or a body of persons from poisoning the water used, or infecting the air breathed by others, and to stay one person from inflicting harm by aggression on others, there can be no question that Government interference is not only unnecessary, but may really become vicious if it attempt to attain an end by official inspection and supervision that can be better attained by the development of free and healthy competition, and by the self-interest and emulation of the trader, since it fetters the development of trade, it stands in the way of the advancement of science, and it interferes to the prejudice of the liberty of the subject.

Much good may be done by statutory regulations for mutual convenience, *e.g.*, for ships meeting and passing on the high seas; but surely no permanent good can be effected by statutory restrictions in points of detail for governing the concerns of trade and of daily life; for example, by restrictions respecting the building of factories and workshops, or the building, equipping, and navigating of ships.

We propose to take into consideration to-night a few examples of modern legislation in which the safety of the subject and the advancement of the commerce of the empire have been sought through the medium of parliamentary restrictions; and we would discuss the question

whether the objects in view have been attained; and, granting this, whether they have been attained in the easiest and surest manner.

The enactments for consideration are parts of the Steam Navigation Acts of 1846, 1848, and 1851; the Merchant Shipping Act of 1854; the Amendment Act of 1862; and the Chain Cables and Anchors Act of 1864; and the objects sought to be obtained are set forth in the preambles to these acts, as follows:—"For regulating the construction of sea-going vessels; for preventing the occurrence of accidents as far as possible in steam navigation; for requiring sea-going steam vessels to carry boats; for the better security of lives and property afloat in sea-going ships," &c.

I.—Bulkheads.

The first question for consideration has reference to watertight partitions in iron steam-ships, known as "bulkheads."

1. The hull of a ship is neither more nor less than a strong hollow box. It is therefore obvious that, in the event of any part of the sides or bottom being stove in, the water will find its way from the part stove in to the whole of the interior, unless there be some contrivance to confine it. Watertight partitions, or "bulkheads," are or ought to be fitted in iron steamers for this purpose.

2. That these bulkheads are not a modern invention, appears from a paper read before the mechanical section of the British Association at Liverpool, on the 15th September, 1837, by Mr. C. W. Williams, of the City of Dublin Steam Packet Company.* From that paper it appears that the plan of dividing a vessel's hull into sections, each of which should be completely watertight, has long been known and practised by the Chinese in their trade barges. In China the several watertight compartments are under lock and key, and are appropriated to separate shippers.

3. In the United Kingdom, watertight compartments appear to have been first applied in 1835, to the "Garryowen," an iron steamer belonging to the City of Dublin Company, and to have been subsequently fitted to most of the steamers, both wood and iron, belonging to the same company.

4. On the first application of bulkheads in this country a practical question suggested itself, viz.—How many of these partitions are necessary to ensure safety? Mr. Williams studied this question carefully. He shows in his paper of 1837, above referred to, that the division of the hull into *three* compartments, by two transverse bulkheads, is objectionable, on the ground that if a ship so fitted were to get stove in at the intersection of either bulkhead, two compartments would fill, and the vessel would go down. He then tried three partitions, dividing the vessel into four compartments, and after careful investigation rejected that number as unsuitable, and he finally came to the conclusion that the least number of sections necessary is five, made by four watertight transverse bulkheads.

5. In 1837, when Mr. Williams read his paper, seven vessels had already been fitted with iron bulkheads on his plan. The engineer, designer, shipowner, and insurer are generally pretty well alive to their own reputation and their own interests, and, as a matter of course, they appreciated the Chinese invention, introduced to notice by Mr. Williams. The *Great Britain*, the first large iron steamer built in this country, was built in 1840. She has six transverse bulkheads, dividing her into seven compartments. Until 1846 there was no law to compel the shipbuilder to adopt any particular invention. He was at liberty to take up, in the whole or in part, or to reject altogether Mr. Williams' plan of "bulkheads." That it was not rejected, the case of the *Great Britain* and other vessels prove.

6. In the year 1846 it was thought that the time had arrived for a more general application of bulkheads to iron ships, and accordingly an Act was passed, with this and other objects in view, intituled "An Act for the Regulation of Steam Navigation, &c." The Steam Navigation Act of 1846, with its unpretentious title, is a very remarkable instance of the application of the thin end of the wedge. When it was before Parliament it appears to have raised so little curiosity that no mention is made in "Hansard" of any remarks or debates respecting it during its passage through either House, and yet this Act was the germ of one of the most extensive and most thoroughly organised systems of Government interference and official superintendence now existing. On the grounds that it was expedient to make provision for "regulating the construction of sea-going steam-vessels, and for preventing the occurrence of accidents in steam navigation," the second section of the Act provided that all steam-vessels of 100 tons burden and upwards should in future be divided by water-tight partitions, so that the fore-part of the vessel should be separated from the engine-room by one of such partitions, and the after part of the vessel from the engine-room by another; and the eighth section of the Act provided that no officer of customs should allow any iron steam ship of 100-tons burden or upwards to go to sea unless she was so fitted. Steam tugs were, all through, exempted from the bulkhead clause.

7. We now meet a very broad question:—It had been proved by experiment that not less than five transverse bulkheads were necessary for the safety of an iron hull. It had been accepted in actual practice that an iron hull of the size of the *Great Britain* should be divided by six transverse bulkheads, into seven compartments, and by longitudinal bulkheads into still more compartments; and yet the Legislature, by the Act of 1846, only required two transverse bulkheads, and no longitudinal bulkheads at all. It had, as we have seen, been accepted in actual practice as a fact, that bulkheads, if sufficient in number, and if properly placed, are essential to the safety of an iron hull. This being the case, would it not have been better, and would it not have been more in accordance with the spirit of our institutions, to have left the matter in the hands of the persons most interested, to find a proper application, and a fair development of the details of construction, rather than to have interfered, especially when that interference fixed, by positive enactment, a rule to be applied to all steamers, without reference to the varying requirements of their construction, build, and dimensions, the service on which they were to be employed, or the description and quantity of cargo they were intended to carry?

8. The Act of 1846 (which contained other provisions besides those relating to bulkheads) was not well received, and was evaded; and in 1848 it was found necessary to pass a further Act to "compel" owners of steamers to attend to the provisions of the former Act. With this additional act the owners appear to have gone on for another three years; when, in 1851, the "Steam Navigation Act" was passed. This Act consolidated the provisions of the former Act, and contained many new provisions, of which mention will be made hereafter. The clause relating to bulkheads was re-enacted, and was extended to all vessels without reference to tonnage, instead of being limited to vessels of 100 tons and upwards as before.

9. At the time this clause was framed there were but very few screw steamers, and although intended to meet the case of all iron steamers, it was in reality only adapted to meet the case of paddle-wheel steamers, in which the engine-room is in the centre of the ship, and in which the bulkheads placed before and abaft the engine-room would divide the ship into three parts, equal, or nearly equal.

10. The time now came when screw steamers made their way, and when the dimensions of iron ships generally were assuming and even exceeding the proportions

* Published by order of the House of Commons, in Parliamentary Paper, No. 319, July 15, 1864, p. 169.

of the *Great Britain*. Builders, insurers, and owners now found out, as Mr. Williams, of The City of Dublin Steam Packet Company, had found out in 1837, that, except in the case of very sharp vessels, in which the engine-room was admidships—vessels only suitable for carrying mails—two tranverse bulkheads alone were wholly useless to keep the vessel afloat in the event of damage to either compartment. In the case of screw steamers, in which the engine-room was right aft, to comply with the Act, and to place one partition before the engine-room and one abaft it, was utterly useless, and even ridiculous. They, therefore, either added more bulkheads than the Act of Parliament required, or they met the letter of the Act by constructing flimsy and inexpensive bulkheads instead of strong ones.

11. In 1854 the *Golden Fleece*, of 2,768 tons, was built with *six* watertight compartments, and in the same year the great Act known as the "Merchant Shipping Act, 1854," was passed. This Act re-enacted many of the provisions of the former Acts, and, amongst others, the now celebrated Bulkhead Clause, which required every steamer to have *two* tranverse bulkheads. With a view to meet the case of screw steamers, and also with a view to prevent the evasions of the former Act, the Act of 1854 provided that the partitions, instead of being as a matter of course one before and one abaft the engine-room, should divide the ship into three equal or nearly equal parts, that the partitions should be of *equal strength* with the side plates of the ship, and that screw steamers should have, in addition, a small watertight compartment inclosing the after extremity of the screw shaft; and no officer of customs could legally allow any iron ship to proceed to sea, or to ply on any voyage or excursion, unless so fitted. These provisions applied equally to the largest and to the smallest iron ship afloat. They applied to the *Scotia* and *Persia* of nearly 4,000 tons, to the *Great Eastern* of 20,000 tons, and to the *Lady Bird* of 9 tons. Vessels crossing the Atlantic, and vessels plying on the Dee above Chester, or on Lake Windermere, were to have bulkheads placed and constructed according to one unvarying rule.

12. How was a collector of customs to know that a ship was properly constructed? that her bulkheads were properly placed? and that they were watertight? In the case of steam ships carrying passengers it is true that the vessels were surveyed, and that he had the declarations of the surveyors; but what was he to do in the case of vessels that do not carry passengers, and of which no survey is required by the Act? Here is a case in which the Act provided that a ship shall not go to sea unless fitted with certain bulkheads, but did not provide for a survey to ascertain the fact. As might have been expected, the Bulkhead Clause (which, as has been shown, was really valueless) soon became a dead letter in the case of cargo steamers.

13. There were also strange inconsistencies in applying the rule for dividing a ship into three parts. If an owner wanted a comparatively small engine-room in the centre compartment, with a long saloon at either end of the vessel, he would contend that the Act intended that the ship should be divided according to the cubical contents of each section; but if, on the other hand, for the purpose of attaining great speed, he found it desirable to allot a great space to the engine-room, then he divided his ship into three equal, or nearly equal, parts according to the length.

14. By the year 1862 it had become a matter of common observation and notoriety that the bulkhead known as the "collision" bulkhead—a small bulkhead in the fore part of the ship, above and beyond anything required by the Act, was, in a general way, in cases of collision, of far more value than the partitions required by the Act. It had also been by this time admitted that two tranverse bulkheads alone in a ship, instead of being the rule, should be the exception, and that the rule contained in the Act was no rule at all: and it will be found on reference to Table I., appended to this paper, that the number of steam vessels lost on our coasts had not decreased.

15. There were in 1862 only two courses open to the legislature; the first was to frame an Act with new rules, to organize a more strict supervision, and to punish evasions by more severe penalties; the second was to repeal the enactment altogether. The latter course was adopted, so that after repeatedly delaying steam ships from going to sea, after racking the brains of engineers and inventors to find out all sorts of contrivances and inventions for fitting doors in useless partitions that would close in cases of emergency, and after putting the owners to expenses and delays innumerable, the bulkhead clause was repealed.

16. Owners, designers, builders, and engineers, are at last left to apply their capital, experience, labour, and skill, in constructing an iron hull according to the manner experience teaches them to be the best. Many people look with regret on the repeal of the bulkhead clauses; but what is really the result? Do we find that ships are built with fewer bulkheads, or that the lives of passengers are placed in greater jeopardy than they were before on this account? On the contrary, if in taking up a newspaper, we turn to the shipping and engineering intelligence, we find an announcement that some well-known line or firm is having a splendid ship built to exceed in speed, accommodation, and beauty, everything attempted before; and that she is to be divided by four or five, or sometimes six watertight compartments, not only by athwart-ship, but by longitudinal partitions.

17. Again, as to existing passenger ships, do we find their partitions neglected so as to become useless because the Act has been repealed? On the contrary, we know that owners and underwriters are too much alive to their own interests. As experience taught them to place bulkheads in their ships in excess of the statutory requirement, so that experience, coupled with self-interest, teaches them to continue to provide bulkheads. From cases innumerable we may select, as cases in point, collisions between the *British Queen* and *Carolina*, in the Mersey; and the *Samphire* and *Fanny Buck*, in the channel. In the case of the *British Queen*, she had five partitions before the engine-room, and, although she was cut down nearly to the keel, she was saved without the water even *touching* one of the old parliamentary bulkheads. Had she been fitted in accordance with the Act, she would have had a space before the engine-room of 90 feet, just half the entire length of the vessel, and she must have been lost. In the case of the *Samphire* and *Fanny Buck*, we have a steel vessel, built with a bulkhead forward, in addition to the bulkheads required by the Act, and these bulkheads are kept efficient although the clauses are repealed. The *Samphire* was struck by the *Fanny Buck* about the spot where this additional bulkhead joins the side of the ship. The bulkhead was torn away by the collision, and the entire fore-part of the vessel was filled. But the *Samphire* is one of those sharp mail steamers, in which the division of the hull into three compartments is comparatively safe. But the division of the *Samphire* is neither according to length nor capacity. Had the *Samphire* had full bows instead of sharp bows, or had there been a sea on, or had she been struck at the spot where the foremost parliamentary bulkhead joins the side of the ship, or had she been struck aft, she would have verified, by most lamentable results, the experiments made by Mr. Williams as to the necessity of five compartments. The Surveyors for the Board of Trade made a series of experiments with a small metal hull, and they found that no arrangement whatever, dividing the hull into three equal sections by two partitions, could in any case keep the vessel afloat. Besides this, the *Sibyl*, *Waterman* 11, *Waterman* 5, and *Waterman* 7 have at different times got stove in on the Thames, and have verified the experiment. We know now that to fit a large iron ship in accordance with the statutory requirement alone, would be to send her forward to probable destruction.

19. The Bulkhead Clause was repealed, not because

bulkheads, if sufficient in number and properly placed, were thought to be unnecessary, but because experience had shown that legislative interference on the subject was useless, and even mischievous, and because it was believed that in this respect owners, designers, and builders knew their own business better than an Act of Parliament could teach them. The result has proved this to be the case.

It may be asked why I have dwelt so long on the Bulkhead Clauses, seeing that they are things of the past? The answer is, that although they are things of the past, and although we can now see that those clauses were absolutely vicious, as having led to great loss of property and much loss of life, they were, for the period between 1846 and 1862, deemed of exceeding importance; and, further, that other clauses, now deemed to be of exceeding value, may, under a somewhat similar process of careful examination, be proved, in like manner, to be either absolutely vicious, or to be inoperative, and therefore delusive.

II.—Boats of Sea-Going Ships.

The next question for consideration has reference to the boats of sea-going ships.

1. By the Act of 1846 it was enacted, that no vessel of 100 tons burthen or upwards, except vessels employed in the whale fishery, should proceed to sea unless supplied with boats, varying in number and cubic contents according to the tonnage of the vessel, and if she carried more than ten passengers one of the boats carried was to be a "life-boat," and the ship was also to be provided with two life-buoys. The greatest number of boats required to be carried in the largest ship was four, and that number was to be carried by ships of 800 tons and upwards, whether coasters or over sea.

2. One point to be specially remarked, with reference to the statutory regulations as to boats, is, that their number and cubical contents were, by the Act of 1846, and are at the present time, determined solely by the tonnage of the vessel, and do not vary according to the service on which she may be employed, nor according to the number of persons carried. This point, it will be shown further on, has mainly contributed to the Boat Clause becoming a dead letter.

3. The "Steam Navigation Act" of 1851 contained very stringent regulations on the subject of boats. A distinction was, for the first time, made between the number of boats to be carried by sailing ships and steamers of like tonnage. A steam ship of 500 tons register was, by the Act, required to carry the same number and description of boats as a sailing ship of 800 tons. The number of boats required to be carried by the largest ship now became five instead of four.

The Boat Clause of the Act of 1851, like the Bulkhead Clause, illustrates the obstructive character of this class of legislation. It makes no provision for inventions and innovations. In speaking of steam vessels it ignores the existence of screw steamers altogether when it states that "in the case of 'steam' vessels two paddle-box boats may be substituted for any two boats named in the Table."

4. By the time that the Merchant Shipping Act of 1854 was passed large ships had become more common. That Act accordingly, instead of taking 500 tons as the highest tonnage named in the boat scale, took 1,000 tons. The number and contents of the boats to be carried were, as in the former Acts, determined by tonnage alone. Each ship was to carry two life-buoys as before, but in the case of sailing ships of 150 tons burthen and under, not carrying passengers, a substantial boat, sufficient to carry the crew, might be provided instead of the boats named in the Act.

5. One or two examples will show how this scale applies:—A sailing ship of 210 tons carries on the average about twelve hands all told; she is required to carry either three boats of 750 cubic feet, or two boats, one of which must be a launch twenty feet long and the other a life-boat, and she must also carry two life-buoys. A steam-ship of 121 tons must carry similar boats to the sailing vessel of 210 tons, whether she is a passenger steamer or not. If she is a passenger steamer she will sometimes, according to the lists published by the Board of Trade, carry between 500 and 600 persons to the three boats and the two life buoys. If she is not a passenger steamer, but is, for example, a screw collier, she will have on board about twenty hands for the same boats and life-buoys. Again, a sailing vessel of 601 tons must carry five boats of 1,463 cubic feet; or if she does not carry five boats, she must carry four boats—one 16 feet long, two 24 feet long, and one launch 25 feet long; one of these boats must be a life-boat, and she must carry two life-buoys. These four or five immense boats will, if the vessel is not a passenger ship, be provided for the safety of about twenty-five people, so that five persons could go in each boat, and each person could have the twelfth part of a life-belt to himself. A steam ship of 361 tons must carry boats and life-buoys of the same number, size, and description as the sailing vessel of 601 tons, and she may carry from 1,200 to 1,300 passengers, so that she will have from 250 to 300 people to each boat, and about the 700th part of a life-buoy to each person. On the one hand it will be seen that there are not enough hands on board a vessel to save the boats, whilst on the other hand there are not enough boats to save the passengers and crew; and that the life-belts required by the Act are utterly inadequate.

6. It will be seen from the evidence taken before the Select Committee on emigrant ships, in 1854, that in some steamers crossing the Irish Channel from fifty to seventy cork belts are provided by the owners, because they think that, as a matter of duty, they should make ample provision for the safety of the passengers; whilst we find that in some other ships, heavily laden with passengers, and crossing dangerous and much frequented parts of a narrow sea, two or perhaps four life buoys only are provided. In the one case the Act of Parliament is disregarded altogether, and ample provision is made in spite of it; and in the other case the Act of Parliament is complied with, and the minimum of safety is the result.

When this class of legislation is operative it is frequently vicious because the minimum of necessity must be adopted as the maximum of efficiency, and where it is inoperative it is mischievous and delusive, since it leads the public at large to believe that it provides for cases that it never reaches.

7. The existing enactments respecting boats are evaded by the majority of coasters and home trade vessels, because they are beyond reason, and because there is no provision to secure compliance. It is true that the Act says certain boats shall be carried by these ships, but it makes no provision for ascertaining that they are carried; whilst as regards passenger steamers, the only class of vessels in which the Act is not inoperative, the Board of Trade have taken upon themselves, in contravention of the Act, to direct that in some few cases where the number of passengers carried is small, certain boats required by the Act may be dispensed with.

8. When an emergency arises we know but too well that the boats which have been passed by the surveyors of the Board of Trade, of the Emigration Office, of the Admiralty, and Post-Office, either will not "lower" properly, or, if they are lowered, do not swim. In the case of the *Samphire* and *London*, where efficiency had been sought without regard to cost, we find that "all the boats were fitted with patent lowering apparatus, which however excellent in daylight, requires a certain amount of coolness and skill to work effectually in a dark night. Hence the loss of life that ensued in lowering one of the boats, and the clumsiness in lowering the other;"* and that "the two pinnaces and port cutter were cleared away ready for

* See report of Messrs. Astley and Mummery to the Board of Trade.

lowering, and bread and water put into them. The starboard pinnace (an iron boat) was launched, and went down immediately." This same iron boat had already been fitted with cork, on the suggestion of Mr. Gladstone, the shipwright surveyor.* And yet we read case after case in which a smack launches a cockle-shell of a boat in the worst weather, in a heavy sea and with rude gear, and rescues the crew of a water-logged ship in successive trips. This boat has not had the benefit of a statutory survey, and yet she is efficient.

9. It is admitted that, as regards boats, the Act is, to a great extent, a dead letter. It generally happens that in the greatest emergencies the boats, with all the statutory inspection, fail. Something must be done—one of two courses is open. First, for the legislature to pass a short Act containing an amended scale, in which the boats and life buoys shall be proportioned to the number of passengers on board, and in which provision shall be made for extended inspection and surveillance; or, secondly, that the boat scale shall be repealed entirely, and that the owners of a ship shall be held responsible for providing sufficient boats and life buoys, according to the exigencies of each case, and for keeping them efficient and ready for use. The experience gained by the operation of the bulkhead clauses, and by the result of their repeal, will invite us to consider to night whether the latter course is not the proper one.

III.—Safety Valves.

The next enactments for consideration are the clauses relating to safety valves on the boilers of marine engines.

1. The act passed on the 28th August, 1846, provided (sec. 14) that the owner of every steam vessel should transmit to the Board of Trade twice a-year, "under the hand of an engineer surveyor approved by the Board, a declaration of the sufficiency of the machinery." The Board of Trade were required to register these declarations, to forward to the owner a certificate of registration, and a penalty not exceeding £100 was to be the punishment for a non-compliance with the statute.

2. This enactment took effect on the 1st January, 1847, and on the 27th August of that year the boilers of the *Cricket*, half-penny steamer, exploded, resulting in the loss of six killed and twelve wounded. From the facts that came out at the inquest, it appeared that the provisions of the Act as to surveys had afforded no security to the public. These provisions had been delusive. They had not led the owner to be careful in the selection of an engineer, nor had they led the engineer to be careful in the management of his boiler. The contrary appeared to be the case. The engines had become leaky in the trunnions, the master and owner complained to the engineer of the loss of speed, and the engineer tied down the safety-valve. A witness on the inquest stated that the engineer "tied the end of the lever down by two pieces of spun yarn to two spike nails, which were driven into a beam athwart the vessel," and that he (witness) was dismissed from the service because he made such an "oration" one Sunday when the engineer, who was drunk, had got the valves fast, and the pressure so heavy that the water was rising with the mercury in the pressure gauge. The engineer was tried, and on being convicted (says the *Annual Register*) the Lord Chief Justice Denman, "after commenting with severity upon the fearful consequences of such proceeding, sentenced him to two months' imprisonment."

3. The Act of 1846 was frequently evaded, so that an act was passed in 1848 (as has been stated) to compel owners to transmit surveyor's declarations to the Board of Trade, and to exhibit a copy of the Board of Trade certificate on the vessel; and an additional fine of 10s. a-day for delays in transmitting declarations, and a penalty of £20 for not placing the certificate in a conspicuous place on board, were imposed.

4. By the year 1851 it was found that the Acts of 1846 and 1848 were almost a dead letter as regarded the safety-valves and surveys, and it was then thought to be time for some rigorous measures to be taken. Accordingly, the Steam Navigation Act of 1851 was passed. This Act contained fifty-one clauses. It created a great number of new offences, and made them punishable by fines of various sums, from 10s. a day to £100 in one sum, or with imprisonment in proportion. It re-enacted most of the clauses of the former Act, and it placed in the hands of the Board of Trade the duty of appointing and removing surveyors, and of regulating the mode in which surveys were to be made. It gave the same department power to cancel and withdraw certificates, and to send their surveyors on board any vessel, at any time, to ascertain any particulars. With regard to safety-valves a clause was expressly inserted to the effect that no ship was to go to sea, or to steam on any rivers of the United Kingdom, unless she was provided with a safety-valve on each boiler "free from the care of the engineer," and out of his control and interference when steam was up; and surveyors were required to examine and report on the safety-valves in question, and to fix the weights to be carried, and consequently the pressure of steam in the boilers.

5. Things went on pretty well for a short time, with an occasional collapse or explosion of no serious moment, and not doing sufficient harm to call public attention to the subject. The Act came into operation on the 1st June, 1852, and in 1853, just as it was becoming known, and the surveyors appointed by the Board of Trade were warming to their work, the *Times*, of Glasgow, blew up off Dublin, scalding 33 people and absolutely killing 12. From the evidence elicited during the investigation, it appeared that the vessel had but recently been surveyed by the Board of Trade surveyors, that she had a Board of Trade certificate, that the safety-valve was in accordance with the Act, and yet, in spite of all the boiler blew up.

6. This case is one that furnishes a splendid illustration of the vice of a system which makes the safety of the public rest on the vigilance of an inspector or surveyor, instead of on the care of an owner;—legislation which tends to remove responsibility from the shoulders of the owners, and of their servants where it ought to rest, and to place that responsibility on official surveyors, where it ought not to rest, and where, as a matter of fact, as opposed to theory, it cannot rest.

7. The boiler of the *Times* had been patched. The surveyor was not aware of this; he never saw it; and yet he was found guilty of manslaughter by a coroner's jury and received a severe reprimand from the Board of Trade officer who conducted the inquiry, for not locking up the valve and giving the key to the master. It is true that, as a surveyor, he ought to have found it out—as a detective he was at fault. But it is also true that this lamentable loss of life might have been prevented if the chief engineer of the vessel—a servant of the owners, who did know of it, and who actually accompanied the surveyor to the boiler—had called the surveyor's special attention to it, instead of leaving him to give his certificate, on the supposition that the boiler was sound, and in utter ignorance of the patch. The penalty ought rather to attach to the owners and their servants, who must be aware of all defects, than to the surveyors, who may sometimes be misled by *suppressio veri*. If a sore place or a defective rivet in a plate of an iron hull, or a crack in a stern-post, or a weak place in a boiler can be concealed cunningly, for the surveyors to give their declarations without first putting the owner to the expense of repairs, the owners are all the better off, but the insurers and passengers, through no fault of their own, are the sufferers, and the public are misled.

8. The case of the *Times* showed that the system of statutory supervision was not then by any means perfect as regards the boilers and machinery, as other cases had shown that it was not yet perfect as regards boats and bulkheads; and in 1854 the "Merchant Shipping Act"

* See report of evidence in case of the *London*, as published in the daily papers.

again dealt with the question. To ensure the surveyors doing their duty now a Surveyor-General was appointed. The Safety-Valve Clause was re-enacted as follows, *viz.*:—Every steam-ship of which a survey is required, "shall be provided with a safety-vale upon each boiler, so constructed to be out of the control of the engineer when the steam is up;" and if such valve is in addition to the ordinary valve it shall have an area not less, and a pressure not greater, than the area of and pressure on that valve. The surveyor is, by the Act of 1854, required to declare the limits of the weight to be placed on the safety-valve, and a penalty of £100 is imposed on any person increasing that weight.

9. As regards safety-valves, "The Board of Trade Instructions"* say (paragraphs 143 to 151) that "the valves are to be so fitted that the engineer may not have the power of increasing the weight on them when the vessel is under steam. The valve may be contained wholly within the boiler, and accessible through the man-hole only," or "on the outside of the boiler, inclosed in a box sufficiently large only for the weights and the necessary motion for them; and, secondly, by a lock, of which the key is to be kept by the *master* of the vessel, who will be responsible should any additional weight or pressure be placed on the valve." These regulations are explicit. To carry them into effect surveyors were appointed with fixed yearly salaries, and these officers were not only to survey the machinery once every six months, but were to take frequent opportunities of visiting every ship arriving in the port; so that thus a constant system of official inspection and supervision was inaugurated, and was superintended by a surveyor general. This was in 1856.

10. On the 30th November, 1860, the boilers of the *Tonning* exploded. It appears, from the report of the inquest at Lowestoft, in the *Shipping Gazette* of 5th November, 1860, "that five men and three boys disappeared altogether at the time of the explosion, and were never heard of afterwards, that five people were landed, dead or dying, by smacks, and five badly scalded, and that out of 30, the whole number of persons on board, 17 only escaped alive; and out of these 12 only were uninjured." The *Tonning's* boilers were fitted in accordance with the requirements of the Act, and the Board of Trade detailed instructions. They had been surveyed by one of the Board of Trade permanent surveyors in the preceding June, and the vessel had a Board of Trade certificate, and yet the boilers exploded!

11. This case and its attendant circumstances deserve careful examination, as they bear out the conclusion arrived at in the case of the *Times*, whilst they show that, however conscientiously the surveyor may do his duty, the evils sought to be avoided are sometimes actually created by statutory regulations. It also shows that the regulations are not yet sufficient in detail or stringency if this system of minute statutory requirements is to be continued.

12. One of the most essential adjuncts to a safety-valve is lifting gear, to ease the boilers; but the Act, although it goes into details, does not provide for this. It rather forbids it than otherwise; for it says that the valve "shall be out of the control of the engineer when the steam is up." The Board of Trade, however, have in their instructions added to this clause, so that the surveyors are to read it as if it were "so that the pressure cannot be increased when the steam is up." But if a lifting gear is not fitted (and there are many valves without lifting gear even now), the Board of Trade surveyors have no power to require it under the statute; and if there is only one valve on the boiler, that valve without lifting gear will be locked up and the key given to the master. The locking-up is a mere delusion, because the padlocks generally used are sold by the gross or by the pound, and can be opened by a bent nail or wire. And there is nothing to prevent the weights from being increased when the steam is not up. If an engineer is dishonest he will increase the weight when the steam is down. If a master is conscientious, and is ignorant of steam, he will keep the key from one six months to another, and will not allow the valve to be opened. The loaded valve may burst the boiler; the locked-up valve may set fast and do the same. Thus, the probability of an explosion is not provided against in the one case, and the very elements of an explosion are actually provided in the other.

13. In the case of the *Tonning* the safety valves had been looked at by the surveyor, and locked up by him. The key was given to the master, who kept it, and nobody ever saw the valves again. The master never gave the key to the engineer. He had commanded several other steamers besides the *Tonning*, and had never been in the habit of giving the key of the safety-valve to the engineers. The engineer said he never thought it his duty to look at the Government valves.

14. Mr. Galloway, in his evidence, stated that "the surveyors made inspections in addition to the six-monthly surveys; that the two statutory-valves had been blown away and lost, and that of the two ordinary working valves under the engineer's control one had not been working for some time, and the other had not the appearance of being a self-acting one. If either of the valves had been fully open the explosion would not have happened."

Another engineer deposed that "the stays had been so far corroded that they would not, in his opinion, sustain 13 lbs." The coroner, in summing up, said the owners of the vessel would not be liable criminally unless they absolutely knew the fact that the boilers would not bear a due pressure; and they could not be liable moreover because at the very time the accident occurred the vessel was running with a proper certificate from the Board of Trade. By no possibility, however, could the slightest blame attach to the owners. The only person against whom it could be possible to return an adverse verdict would be the chief engineer, as he had charge of the boilers at the time the accident happened. With reference to the Government valves, he (the coroner) was much struck with an observation made by Captain Robertson, and also by the chief engineer of the ship, that it would be desirable to examine such valves more frequently from time to time. But it appeared from the evidence that all other engineers of steamers were in the habit of trusting entirely to the examination of Government surveyors, and therefore, although it might be very proper and desirable that engineers should look at Government valves, he did not think the fact of their not having been looked at in this instance ought to bear hardly against the chief engineer of the *Tonning*. One could scarcely expect the engineer of a steamer to look at the Government valves, unless some rule of a general character was laid down on the subject. It is needless to say that the Board of Trade did not agree with the coroner's summing up, and issued a circular to the effect that the survey does not relieve the owner and his servants of their responsibility.

15. In the case of the *Cricket*, the valves were left open, and a drunken engineer tied them down. In the case of the *Times*, the surveyor was kept in ignorance of the real state of the boiler, and received a severe reprimand from the Board of Trade for not giving the key of the locked-up safety-valve to the master. In the case of the *Tonning*, the valves were locked up, and the key given to a conscientious man, who would not open them in the absence of a government officer. The result was the same in each case—an explosion, but each worse than the former.

16. It must be evident from what has already been stated, first, that the Act, stringent as it is, is not the cause of our immunity from accident; secondly, that if it is to be relied on, it must either be made more stringent or to a great extent modified.

* These instructions can be purchased at the Queen's printers, for 2s. 6d.

17. It may be asked how is it that there are not more explosions, if the Act is so defective? The answer is, that the surveyors, the working staff, on whom the real duty and responsibility must rest, are practical men, and that they are looked on, in the majority of cases, rather as friends and advisers of owners, masters, and engineers, than as surveyors, inspectors, and detectives. They act as *ex-officio* consulting engineers to owners, and by their practical experience, by their tact, and by their sound common-sense, they are able to induce owners, by reason and for their own advantage and self-interest, to effect improvements and repairs without reference to the requirements of the statute; but where-ever the statute has been of value, it has been in spite of, and not because of, the requirements respecting the details of construction. And it is by mutual confidence and good understanding that enactments, insufficient and comparatively useless and delusive in themselves, have been rendered harmless in very many cases; but in some cases, where a strict adhesion to the Act is relied on, the surveyors have great difficulty, and give their declarations in fear and trembling.

14. One of the great difficulties a surveyor is likely to meet with is in limiting the steam-pressure. In settling the pressure to be placed on the safety-valves, the engineer has two points to consider. Both these points frequently give much trouble—points on which the Act is silent, on which it would be impolitic, for obvious reasons, for the State to lay down any fixed rules, and yet points on which the chief surveyors throughout the country have had to come to a mutual understanding among themselves. I refer, firstly, to the proportion of area of safety-valve to grate surface; and, secondly, to the stay power of boilers.

18. The proceedings of the surveyors in passing safety-valves may be comprehended in a general way as follows:—They first ascertain the pressure that the stays will bear, at the rate of 5,000 lbs to the sectional inch. They then see that the safety-valve is not below the proportion of half-an-inch of area to each square foot of grate. They then place the proper weight on the valve. It must be here observed that the maximum of 5,000 lbs. pressure on stays, and the minimum of half-an-inch area of valve to a foot of grate surface, is not an arbitrary rule, never to be departed from in special cases, and likely to prevent improvement; that it is not a statutory rule, nor a rule made by any State department; but that it has been adopted by the surveyors amongst themselves, because it was found to fall in with the practice, for the time being, of the best makers of engines in the country. It would, we may conclude with certainty, be altered to-morrow, if it no longer coincided with actual practice.

19. To lay down a fixed rule, *e.g.*, a rule to limit the length of iron girders in railway bridges, to limit practical men in the use and application of material, is objectionable; but for practical surveyors to lay down a rule as a daily guide, embodying the known practice of the best makers and varying from time to time to keep pace with improvements and inventions, is advantageous, and, if minute official supervision is to exist, is necessary. The benefit of such a rule must have been shown in cases in which the safety-valves have been dangerously small, or in which an unsafe pressure may have been otherwise placed on the stays.

20. It is scarcely credible that at the present day the presence or absence of proper stays in a boiler should sometimes be urged by an owner as of no moment when endeavouring to obtain a Board of Trade certificate, and yet this is the case. If it is so, the answer at once then is, the statutory surveys do good, because they prevent those boilers, imperfectly stayed and with small valves, from being used in steamers carrying passengers. But look back a little, and it will be seen that the explosions and loss of life mentioned have happened on board vessels coming under the statutory survey, and that the loss of life from explosions in vessels carrying the Board of Trade certificate exceeds greatly the loss in vessels not so certified. In fact there has been no serious explosion on board a steamer without a Board of Trade certificate. It must also be borne in mind that if there were no detailed statutory requirements, the owner of a steamer would have his responsibilities before his eyes, and would have his boiler properly made and worked, or would, if he used a dangerous boiler, do it on his own risk, and without the protection of the statutory details. But, as there are detailed regulations, if he meets these regulations and his defective boiler and valve manage to pass the surveyor, he would carry the Board of Trade certificate, and would, according to the mistaken views expressed in the Lowestoft case, allow the passengers on board his vessel to be blown up, on the authority of the statutory survey and certificate. And, again, we know that a Board of Trade certificate is, in many cases, obtained simply to sell a vessel, and, so long as the seller can sell his vessel as sufficient under that certificate, he will, if she is an old vessel, do as little as he can and only just enough to comply with the statute and pass the survey. If the boilers will hold out for a month (and they must be poor boilers that will not do this), and if they will only just stand double the working pressure under cold water, and without reference to stay power, that may be enough for a man who wants to sell an old vessel: but it would not be enough for a man who would work a boiler on his own responsibility, and it is not enough for the safety of the public; and yet some owners would think themselves sorely ill-treated if a statutory declaration and passenger certificate were not granted under the circumstances; and, moreover, the public at large, finding that they are in continual safety on board a passenger steamer, believe that this safety is due to statutory interference in details of construction.

IV.—COMPASSES.

The next subject for consideration is the clause relating to the compasses of iron ships.

This clause appears for the first time in the "Merchant Shipping Act, 1854," sec. 301.

I had written a chapter on the subject of compasses, but as the question has been so thoroughly reviewed, and so thoroughly ventilated lately, I thought it best to strike out my review of the facts, and in lieu to remark that the real point at issue between the President and Council of the Royal Society and the Board of Trade may be summed up in a few words by stating that the Royal Society wish to force the Board of Trade to undertake a system of compass supervision similar to the system adopted in the Royal Navy. The Royal Society are not prepared, however, with any practical rules for the guidance of the mercantile marine,—they want a compass department and officers established first, and the practical rules afterwards. The Board of Trade do not see the question in the same light. The Astronomer Royal and the mercantile marine do not agree with the Admiralty and the Royal Society as to the method of applying the corrections, and a third person now comes forward to remove the cause of difference altogether by demagnetizing a ship. The correspondence containing the facts has been published, and has doubtless been read by every one interested; so that that correspondence will serve as a basis for discussion better than any remarks I might make. I now pass on to the next subject.

V.—ANCHORS AND CABLES.

The next and the last subject for consideration is recent legislation respecting the ground tackle of ships.

1. Chain cables, both for mooring purposes and for ships' armour, were, it would appear, known in the time of Julius Cæsar.* They were revived for mooring ships at the beginning of the present century by Captain Brown (Brown, Lenox, and Co.), and they were recently used by way of defence in the *Kearsage*, during her celebrated encounter with the *Alabama*.

I do not propose to enter into any historical details,

* See note in Lemaire's edition of Cæsar's works.

nor do I propose to express any opinion on the merits of the various anchors and cables with which the seafaring man and the Patent Office are so familiar. Chain cables have now utterly displaced the hempen cables as moorings for ships. It is on her anchors and cables that a ship and her valuable freight of human beings and merchandize often has to rely for safety on a lee shore, and it is by the failure of cables that fearful losses are too frequently incurred, as in the case of the *Royal Charter*.

2. That iron cables have become shamefully bad there is no doubt, when we contemplate the number of anchors lost on our coasts in each year. There is no official return from which I can quote figures showing the exact number of anchors lost, but from a calculation of my own I am satisfied that somewhere between 700 and 800 anchors are picked up by boatmen on the coasts of the United Kingdom alone in each year. It is true that each of these anchors does not represent a bad cable, since many are slipped purposely, and some are lost through carelessness, or by the total wreck of a ship; but eliminating these, we may be safe in assuming that not much less than 400 anchors are lost annually on our coasts through bad cables. This being the case, it became a matter of serious consideration whether something should not be done to improve the manufacture, and to insure a sufficient test.

3. The matter was taken up by Mr. Laird, M.P. for Birkenhead, Sir James Elphinstone, and Mr. John Trotman, of anchor celebrity; and on the 23rd June, 1864, through their exertions, the Chain Cables and Anchors Act became law.

This Act provides "that it shall not be lawful for any maker of, or dealer in, chain cables or anchors to sell, or contract to sell, for the use of any vessel any chain cable whatever or any anchor exceeding 168 lbs. in weight, unless previously tested and stamped" at a machine licensed by the Board of Trade; and it empowers the Board of Trade to license machines belonging to any "corporation, public body, company, or person or persons" passing the survey of the Board of Trade inspector. This Act has so far done good that it has called the attention of the public at large, and especially of the shipowner and insurer, to the fraud until recently existing in a certain class of the anchor and cable trade.

4. But it is a question whether this Act will really be of the great service that its promoters anticipated, or whether it is indeed what the promoters really desired. As it stands, it is a favourable example of an Act that does too much and yet too little. It gives the Board of Trade power to licence a machine as fit to test anchors and cables; but it provides no guarantee for the faithful and honest use of that machine when once licensed. It imposes a penalty for breach of its provisions, but it gives no power to an officer of customs to stop a ship without properly tested cables.

5. It errs, it has been alleged, in giving any maker the power to test his own cables for a certificate of public proof, and some even go so far as to say that it errs through not giving the Board of Trade power to regulate the selection of the iron for the manufacture of the cable, the process of testing, and the temperature of the testing-shed. But to my mind it errs grievously and fatally in making the test compulsory at all. Compulsory and stringent as the Act is, it is a matter of common knowledge and observation that it is evaded daily.

6. Public sympathy will with certainty be enlisted on the side of Mr. Laird and the promoters of the bill in their endeavours to save human life; and the majority will be with me when I say that I am wholly on the side of Mr. Laird and the promoters of the bill as to many advantages to be gained by testing-houses, properly established and properly used; but I wholly object to anything but public independent proofs. I am satisfied by observation, and I am confirmed in my conviction day by day, that the Act which does not now require this must be amended, or it will become a mere delusion, like other compulsory statutes. They rely on supervision and penalties, Government help, and Government prosecutions, rather than on self-interest.

7. From articles that have appeared in the public prints, and from questions put to and answered by Mr. Milner Gibson in the House, we know that great pressure was brought to bear on him to induce him to refuse to license a maker to test his own goods in his own yard for a public proof mark under the existing Act; but, however much Mr. Gibson might agree with the necessity for public test alone, his reply was in effect "How could he do so in the face of the Act?" The views, urged with great reason and force, were, in effect, "How can Mr. Gibson refuse to license Mr. Lenox as Mr. Lenox, or Mr. Parkes as Mr. Parkes, when Mr. Lenox or Mr. Parkes, by making their concerns into Lenox and Co. (limited), or Parkes and Co. (limited), and keeping the greater number of shares to themselves, could claim a license as a company? or, again, if he refused Mr. Parkes, Mr. Lenox, and Mr. Woods singly as manufacturers, how could he, as required by the Act, license them in the aggregate if they formed a testing company. It would, indeed, have been a fatal mistake, and, at the outset, the machines at Tipton (to which the Liverpool merchants specially objected) could not have been licensed, and the trade must have been stopped.

8. People who object to the Board of Trade granting a license to a maker under the act say, "We do not let a jeweller test his own watch-cases and plate, nor are we willing to allow him to affix the hall mark." Why then should a department of the State authorise a cable maker to test his own chain cables for public proof under the recent statute, and affix his proof-mark? The answer is perhaps as follows:—Assuming that the cases are analogous (and this remains to be proved), and assuming that the granting or refusing a license to an individual rests with any department of the State, then that department ought not to grant a license to allow a maker to test his own cables. But are the cases analogous? Here the argument breaks down. They are not analogous. The statutes are essentially different, and before the action in both cases can be assimilated the later statute must be altered to agree with the other. It is of course idle to argue on general grounds that because a certain course is adopted in one case it should also be adopted in all others. If this were so we should simply go on applying rules according to precedent indiscriminately, and without inquiring whether the precedent is good or bad.

9. To the honest and efficient manufacturer testing and superintendence under the Chain Cables Act are needless and useless; to the dishonest trader, with a licensed machine in his own works, the test is equally useless for public safety, but more mischievous, because he can alter it the moment he has obtained his license, and he can then give a certificate of proof with a bad cable tested at a false machine.

10. Whilst these objections can be urged against the existing Act, it may with reason be argued that public proving houses, worked by public servants or public corporations, and totally unconnected with trade influences, would be of value as a guarantee beyond dispute between buyer and seller, as they have usually been in the case of jewellery and plate, and on the whole, as stated above, a majority will be found in favour of such a test. But it must be voluntary to be *bonâ fide*; the moment it is made compulsory it becomes a delusion. The end sought might be attained if corporations had power to erect machines to be licensed by the Board of Trade, and if every purchaser had the power of having his chains tested at those machines at the expense of the seller, with the understanding that they were to be returned on the seller's hands if not up to the test. There would then, in a short time, be but few bad chains in the market. The maker would, for his own self-interest, provide a proper machine in his works, and for that self-interest he would use it efficiently, so as not to cheat himself. The shipowner would appreciate its value by

obtaining insurance at a lower rate. The insurer would not insure a vessel at the current rate unless her chains were represented to be efficient. The foreign buyer would make it a *sine quâ non* that his chains and cables were proof marked; and, above all, loss of life would diminish—a reality would be substituted for a delusion—and this would be effected not by compulsory interference and dictation, but by enlisting self-interest on the side of the trader, and by leaving trade to its own resources for free and healthy development.

CONCLUSION.

1. This paper is, as has been already pointed out, intended to open up a discussion of the question whether the objects sought to be attained by the detailed statutory regulations to which I have referred have been attained; and, granting this, whether those objects have been attained in the easiest and best manner.

2. Mistake is frequently made when, in speaking of an administrative department of the State it is said, "Why does this department do so and so?" or, "Why does not that department interfere to protect us?" People who ask these questions do not think that the department they are condemning may be tied down by the express provisions of a special statute. The question ought not to be, "Is such a department right in requiring this, or wrong in not requiring that?" but, "Is our legislature right in requiring this, or wrong in not requiring that?" And so to night our question is not whether certain statutory provisions are properly administered, but above and beyond that, "whether, on public grounds, those statutory provisions should exist?"

4. I have endeavoured to point out:—

(*a.*) As regards bulkheads, that the statutory regulations, if observed, would have caused ships to be sent to sea absolutely unsafe, and that safety has been obtained through a total departure from the statute; and I have given examples in which ships fitted according to the Act have been lost under circumstances in which ships fitted regardless of the Act have been safe.

(*b.*) As regards boats and life-buoys, that the boat scale is against reason, and opposed to experience; and that the provision for life-buoys allows the seven-hundredth part of a buoy to a passenger.

(*c.*) As regards safety-valves, we have seen that an explosion, each worse than the former, followed every addition to the stringency of the regulations; and that locking up the safety-valve, as required by the Board of Trade Regulations, and giving the key to the master, who knew nothing about steam, instead of to the engineer who did, was the cause of the worst explosion of all.

(*d.*) As regards compasses, whilst the Admiralty and Royal Society are at variance with the Astronomer Royal and the Mercantile Marine, and now that Mr. Hopkins proposes to take the bone of contention away from the philosophers altogether by demagnetising a ship, the Board of Trade are called upon to exercise "a more direct and systematic supervision over the adjustment of the compasses of ships of the mercantile marine," and are informed that "the theory of deviation, its causes and its laws, are thoroughly understood;" and that results have been obtained "suggesting modes for constructing iron ships." As the subject is so "thoroughly understood," it is to be hoped that the mercantile marine, in which there are some of the best seamen and most scientific observers of the day, will be able to avail itself of the "understanding," and that they will be able to appreciate the suggested "modes" of constructing ships. If the information is so thoroughly reliable, and the suggested "modes" of construction so good as to commend themselves, where is the necessity for statutory regulations and state supervision?—and if the information should not be reliable, and if the "modes" should not be believed in by practical men, the State ought still not to interfere.

(*e.*) As regards anchors and cables, the defects of the existing system have been pointed out, and a course that is likely to lead to better results, without any of the objections to the present system, has been suggested.

5. And now let me ask what has all the state nursing of the last few years led to, that people should want more of it? Does it not, in theory, lead to an abandonment of individual character and self-reliance, and has it not done so in fact?* There are some sterling officers of the mercantile marine whose individuality and self-reliance it would be impossible to impair, but, in too many cases, the good old maxims of the good old seamen seem to be forgotten under the paternal rule. All sorts of excuses are sometimes urged for not using the lead, or for not taking observations, or for relying on a compass-needle as an instrument of mathematical accuracy and precision. Scarcely a ship is now stranded on our coasts without the casualty being followed by a recommendation to the Board of Trade that a buoy, or a beacon, or a lighthouse, or a light vessel, or a harbour of refuge be erected, and this in two cases out of three when a single cast of the lead, or the commonest attention to seamanship would have saved the vessel.

6. There are present this evening many shipowners and ship-builders; we hope to hear from them whether they think it possible for a ship to be constructed and equipped without statutory regulations in details. If so, I ask them to say so. There are also many of the public here who may think that an owner and a builder ought to be looked after; to these I would suggest that before they ask for more Government supervision, let them show that it has saved, or that it will save, life and property. A synopsis of the Acts of Congress, issued by Mr. Chase, the secretary to the treasury at Washington, is appended. This abstract will show that, under the United States Government, a statutory code has been passed far more stringent than any ever passed in this country. The results we have heard of.

7. I will now conclude by reading one of the tables appended to this paper, viz., a list of 24 large vessels, of the aggregate tonnage of 16,074 tons, lost, with 460 lives, on the east coast of Ireland alone, from 1856 to 1865, with the cause of each loss; and I will ask you again, have we anything to be proud of in legislation that leads to such a result?†

APPENDIX.

Synopsis of the Act of Congress, passed August 30th, 1852, relating to Steamboats, defining the duties of the Masters and Owners required by the law, and the penalties imposed for its violation.

SECTION 1.—No papers to issue to any steamer carrying passengers until the provisions of this Act are complied with, and if any such steamer is navigated contrary thereto, the penalty is 500 dollars fine.

SECTION 2.—*Precaution against Fire.*—All combustible materials must be placed at a safe distance from heated metal; and any wood exposed to danger from heated metal or fire must be shielded by incombustible material. The inspectors will also require provisions to be made for blowing steam in the hold in case of fire, and also that spark arresters be provided to prevent sparks from being driven back from the furnace doors when drawing the fires or cleansing the furnaces.

SECTION 3.—Provides for double-acting forcing pumps and hose. Steamers of over five hundred tons burden must have three pumps; of two hundred tons and less than five hundred tons burden, two pumps; and all of less than two hundred tons burden, one pump, and hose two-thirds the length of the boat for each pump, to be kept in perfect order, and ready at all times for immediate use.

SECTION 4.—Relates to life-boats, one of which on each steamer must be made of metal; all ocean and lake steamers, of from five to eight hundred tons burden, must have three

* See Tables in Appendix.
† Table II.

life-boats; and from eight hundred to fifteen hundred tons burden must have four life-boats; and all of more than fifteen hundred tons burden must have six life-boats, all of which must be well furnished with oars and other apparatus, and at all times kept ready for use. Steamers navigating rivers only must have one life-boat made of metal, of suitable dimensions, furnished with oars, and kept at all times ready for use.

Section 5.—Provides for a life-preserver or float for each and every passenger, to be kept in convenient places, and always ready for use. It also provides for fire-buckets and axes. For all steamers of 500 tons and under, 20 buckets and 5 axes; from 500 tons and less than 600 tons, 25 buckets and 5 axes; of 600 tons and less than 700 tons, 30 buckets and 6 axes; of 700 tons and less than 800 tons, 36 buckets and 7 axes; of 800 tons and less than 900 tons, 39 buckets and 8 axes; of 900 tons and less than 1,000 tons, 43 buckets and 9 axes, and so on according to tonnage, up to 3,500 tons, all of which must be kept in good order and in suitable places ready for use.

Section 6.—Provides that there shall be sufficient means of escape convenient to passengers from main to upper deck.

Section 7.—No loose hemp, gunpowder, or other dangerous articles shall be carried as freight, without a special license for that purpose, under a penalty of one hundred dollars.

Section 9.—*Art.* 1.—Application for inspection must be made in writing by the master or owner. *Art.* 5 prescribes the mode of carrying gunpowder, burning fluids, materials which ignite by friction, and other dangerous articles, which must be kept in safes or chests, made of metal or entirely lined therewith, or one or more apartments of the boat thoroughly lined, at a secure distance from any fire. *Art.* 10 makes it unlawful to employ any person to serve as engineer or pilot who is not licensed by the inspectors; penalty, one hundred dollars for each offence. *Art.* 11 requires repairs to be made whenever necessary, in order to make the navigation of the vessel safe, and for the neglect of which, the master and owners are held responsible for all damage to passengers which shall occur from such neglect. *Art.* 12.—If any vessel shall be navigated (with passengers on board) after the inspectors have refused to give a certificate of approval, the penalties are the same as if she were run without a license, viz., five hundred dollars.

Section 10.—Where the number of passengers is limited, no greater number shall be taken on board the vessel. The penalty of this is to refund the passage-money and a fine of ten dollars for each person beyond the number allowed. And further, for the violation of any implied undertaking in regard to furnishing food, lodging, &c., or where the progress of the vessel is impeded by the towing of barges or other craft, for a distance of more than five hundred miles, without previous and seasonable notice being given to passengers, in all such cases the passage money shall be refunded, and all damages sustained by such default or delay shall also be paid.

Section 11.—For intentionally obstructing or deranging the means of regulating or indicating the pressure steam, two hundred dollars fine, and imprisonment not exceeding eighteen months.

Section 12.—That if at any time the water in the boiler be suffered to fall below three inches above the flue, if it be by the order, assent, or connivance of the master, he shall be fined one hundred dollars; and if an explosion or collapse happens in consequence of such deficiency, he may be further punished by imprisonment, for a period of not less than six nor more than eighteen months.

Section 16.—For using, or causing to be used, any boiler, or steam-pipe connecting the boilers, made (after the 1st day of July, 1853) of iron not stamped according to law, five hundred dollars forfeit.

Section 25.—One copy of all certificates of inspections required by this act (including those for carrying gunpowder, &c.), to be kept at all times, in some conspicuous place in the vessel, where most likely to be observed by passengers, in default of which, a fine of one hundred dollars is imposed.

Section 27.—All equipments of boats must be kept at all times in conformity to the inspectors' certificate. In default of which, the master is liable to a fine of one hundred dollars, or imprisonment not exceeding two months, or both.

Section 28.—That on any such steamer navigating rivers only, where from darkness, fog, or other cause,

TABLE I.

Statement showing the number of *Steam* Ships lost or damaged on the Coasts of the United Kingdom, and the number of Lives lost in consequence; also the number of *Vessels* of every description lost or damaged by collision or otherwise on the Coast, and the number of Lives lost in consequence; from 1851 to 1864 (inclusive).

	STEAM SHIPS.						TOTAL—SHIPS.	
					Total.			
Year.	Lost.	Lives lost.	Damaged.	Lives lost.	Casualties to Steam Ships.	Lives lost in Steam Ships.	Number of Vessels of every description lost or damaged.	Number of Lives lost.
1851	9	1	40	..	49	1	1,425	293
1852	9	16	12	1	21	17	1,072	920
1853	10	173	17	2	27	175	905	689
1854	16	520	31	..	47	520	1,081	*1,549
1855	14	43	57	..	71	43	1,388	469
1856	12	1	90	10	102	11	1,469	521
1857	13	44	101	1	114	45	1,420	532
1858	23	53	99	1	122	54	1 471	340
1859	19	487	81	6	100	493	1,769	†1,647
1860	11	72	78	12	89	84	1,677	537
1861	11	75	76	1	87	76	1,819	884
1862	16	113	101	6	117	119	2,827	690
1863	12	33	74	2	86	34	2,001	620
1864	22	82	114	1	136	83	1,741	516
	197	1,713	971	43	1,168	1,756	21,065	10,207

* In this year the "City of Glasgow" and "Tayleur" were lost. † In this year the "Royal Charter" and "Pomona" were lost.
(Note.—The "John" was lost in 1855—191 lives lost.)

TABLE II.

List of Inquiries, held by direction of the Board of Trade, into the Loss of Vessels on the East Coast of Ireland in the years 1856 to 1865 inclusive.

Year.	Name of Ship.	Tonnage.	Where wrecked. Direction and force of wind.	Lives lost.	Report after inquiry.
1856	*Proteus*, of Sherborne, U.S.	273	Blackwater Bank Wind S.S.W.—9	2	A foreign ship. No inquiry held. Vessel lost through neglect of the lead.
1857	*Emperor*, of Liverpool, from Liverpool for Bahia	368	Blackwater Bank S.S.E.—6	nil	Neglect of lead. Master's certificate suspended for six months.
"	*Lady Ebrington*, of Liverpool, from Liverpool for Valparaiso	413	Blackwater Bank S.S.E.—5	nil	Master reprimanded and cautioned as to use of lead for future.
1858	*Sir Charles Napier*, of London, from Liverpool for Sierra Leone	620	Kish Bank...... S.S.E.—6	1	Improper stowage. Compass affected by cargo. Master reprimanded.
"	*Rose* (steam ship), of Glasgow, from Morecambe Bay for Belfast	344	Bush Rock, west point of Copeland Island.... W.N.W.—4	nil	Neglect of lead. Master admonished.
"	*Amazon*, of Liverpool, from Liverpool for Pera..............	237	Arklow Bank.... S.W. by S.—5	nil	Neglect of lead. Master's certificate suspended for six months.
1859	*Pomona*, of New York, from Liverpool for New York	1,500	Blackwater Bank E.S.E.—9	424	Neglect of lead. Master drowned.
"	*Clymene*, of Workington, from Liverpool for ——	745	Kish Bank...... Unknown	nil	Neglect of lead. Master admonished.
1860	*Calcutta*, of London, from Liverpool for Madras	527	Arklow Bank.... S.S.W.—4	nil	Neglect of lead. Certificates of master and mate suspended for six months.
"	*Lydia*, of Liverpool, from Liverpool for Monte Video	433	At Ballinamona, inside the Blackwater Bank ... E.—11	3	Unable to weather the bank, and was run ashore. Master's certificate suspended for six months.
1861*	..	..	..	..	..
1862	*Adonis* (steam ship), of Waterford, from Belfast for Waterford..	334	Muglin Rock, near Dalkey Island, Dublin Bay .. N.N.W.—6	nil	Vessel lost by neglect of master. His certificate of service cancelled.
"	*China*, of Windsor, N.S. from Liverpool for Halifax	830	Kish Bank ...... Variable.—4	nil	Neglect of lead. Master's certificate of service cancelled.
"	*Dalemain*, of Liverpool, from Liverpool for L'Union, Central America	275	Arklow Bank.... S.W.—8	nil	Neglect of lead. Master's certificate suspended for three months.
"	*Eliza Bencke*, of Liverpool, from Liverpool for Bombay	983	Glasgorman Bank, Co. Wexford .. S.E.—6	nil	Neglect of chart and bearings of lights. Master's certificate suspended for three months.
"	*Portia*, of Liverpool, from Liverpool for Pernambuco	298	Lucifer Bank, Co. Wexford ...... S.E. by S.—7	9	Neglect of lead. Master acquitted. [The Board of Trade did not agree with finding of Court, considering that the master should have provided himself with a recent chart of the channel, and have used the lead.]
1863	*Sarah Palmer*, of Liverpool, from Calcutta for Liverpool	1,301	One mile S.S.W. of Tuskar Rock N.N.E.—8	nil	Neglect to take bearings. Master's certificate suspended for six months.
1864	*Desert Flower*, of Liverpool, from Liverpool for Calcutta	1,216	Long Bank, Co. Wexford...... S.E.—4	2	Neglect of lead. Master's certificate suspended for twelve months.
"	*Euroclydon*, of Liverpool, from Quebec for Liverpool......	1,325	Tuskar Rock .... W.—2	nil	Careless navigation. Master's certificate suspended for six months.
"	*Florist*, of Liverpool, from Liverpool for Nassau	264	Long Bank, Co. Wexford ...... S.S.E.—8	nil	Neglect of lead. Master's certificate suspended for six months.
"	*Grasmere*, of Liverpool, from Greenock for New Zealand	432	Ballyferis Point.. N.—5	nil	Careless navigation. Master's certificate suspended for six months.

* No casualty.

TABLE II.—(*Continued.*)

Year.	Name of Ship.	Tonnage.	Where wrecked. Direction and force of wind.	Lives lost.	Report after inquiry.
1865	*Savoir Faire*, of Liverpool, from Liverpool for Calcutta	1,395	Blackwater Bank N.N.E.—6	nil	Neglect of lead, &c. Master's certificate suspended for nine months.
1865	*Ocean Ranger*, of Liverpool, from Liverpool for Savannah	456	Malahide Bank .. S.S.E.—7	nil	Neglect of lead and careless navigation. Master's certificate suspended for twelve months.
"	*Barbadian*, of Liverpool, from Liverpool for Barbadoes	724	Blackwater Bank S.W.—9	19	Neglect of lead and careless navigation. Master drowned.
"	*Lady Hobert*, of Liverpool, from Liverpool for Bermuda	781	Malahide........ S. to S.S.W.—10	nil	Bad navigation. Master's certificate suspended for six months.

Totals.

Ships..	24
Tonnage	16,074
Lives lost..	460

the pilot on watch deems the navigation of the vessel unsafe, or the engineer on watch shall be of opinion that the further navigation of the vessel is unsafe, and after being so admonished, the master then proceeds on his voyage without heeding such admonitions, he and the owners shall be liable for all damage to passengers resulting from such pursuance.

Section 29.—For neglecting or refusing to observe pilot rules, the master shall be liable to a penalty of thirty dollars, and all damage done to passengers resulting therefrom.

Section 30.—The master and owners are liable for all damage sustained by any passenger from explosion, fire, collision, or other cause, if it happen through any neglect to comply with the law.

Section 35.—A correct list of all passengers to be kept on record, and at all times open to the inspection of the inspectors and officers of the Customs, and in default the master shall forfeit one hundred dollars.

Section 36.—Two copies of the law to be kept on all steamers, and if he should unreasonably refuse to exhibit a copy to any passenger, the commander shall forfeit twenty dollars.

The Act of Congress of March 3rd, 1843, requires extra steering apparatus, in case the pilot is driven from the wheel by fire.

Treasury Department, June 10, 1864.

The following extract of Act of Congress, approved June 8, 1864, is published for the information and government of the officers of the Customs, supervising and local inspectors of steamboats, and others concerned.

S. P. Chase, *Secretary of the Treasury.*

Section 3.—And be it further enacted, That each engineer and pilot licensed according to the provisions of said act, shall pay for every certificate granted by any inspector or inspectors the sum of ten dollars, to be accounted for in the mode provided by law.

Section 4.—And be it further enacted, That the forty-second section of the Act of August 30, 1852, be so construed as to require the inspection of the hull and boiler, in the manner prescribed by that Act, of every vessel propelled in whole or in part by steam, and engaged as a ferry-boat, tug, or towing-boat, or canal boat, in all cases where, under the laws of the United States, such vessels may be engaged in commerce with foreign nations, or among the several States.

Section 5.—And be it further enacted, That all engineers and pilots of ferry boats, tug boats, towing boats, or canal boats, subject to inspection by this Act, shall be classified and licensed in the same manner as are pilots and engineers by said Act of August thirty, eighteen hundred and fifty-two.

Section 6.—And be it further enacted, That in lieu of the fees for inspection required by the thirty-first section of the Act of August thirty, eighteen hundred and fifty-two, the following shall be paid:—For each vessel of one hundred tons, or under, twenty-five dollars, and in addition thereto for each one hundred tons, over the first one hundred tons, five dollars.

Section 7.—And be it further enacted, That all parts of the Act aforesaid, which are suspended by, or are inconsistent with, this Act, are hereby repealed.

Approved June 8, 1864.

DISCUSSION.

Mr. Frederick Wood said, notwithstanding the arguments brought forward in the able paper they had just heard, he was of opinion that although all matters of detail should be left as much as possible to the shipbuilder, it was the duty of Government to step in and see that no precautions were omitted for the security of life and property. He thought the author of the paper had dealt a little unfairly towards the Government in mentioning gross acts of negligence on the part of masters, and apparently expecting the Government to be responsible for them. It was argued that the value of a vessel and cargo were sufficient inducements to cause a shipowner to study her safety before every other consideration. He denied that that was the case. In the first place, the vessel could be insured; the cargo for the most part belonged to other persons, and that could also be insured; while the passengers' fares were paid. It became a mere calculation of probabilities for a shipowner to send a vessel to sea over-laden and with the neglect of ordinary precautions, because it was extremely unlikely during many months of the year that a ship leaving these shores would encounter a hurricane within the first fortnight of her departure, and after that she would be in better trim to meet it. He could not agree that optional was better than compulsory inspection—the former was in fact of little value. He thought the author of the paper was a disciple of that great leader of modern political heresy, the author of the essay on "Liberty." Was it a truism that shipowners would always have vessels constructed in the best possible manner? And was it equally a truism that the best provision was made for the preservation of life, without any regard to the profits to be made by the voyage? He had listened in vain for any allusion to the crews of ships. Few persons would dispute that the crew formed a not unimportant part of a ship's equipment, and yet a vessel might leave our ports without a single seaman on board, and the Government had no power to interfere, for so long as the commander of the vessel and his officers were certificated by the

Board of Trade, it was sufficient! A great proportion of the losses at sea were owing to the miserably insufficient crews which were sent out. There was another point of great importance, which produced more evil results than any interference on the part of the Government could do. It was no longer compulsory upon shipowners to carry apprentices, and it was well known that the race of the British sailor was thus rapidly becoming extinct. Vessels were now manned with the most heterogeneous mixture of people—Swedes, Norwegians, Danes, and men from all parts of the world, some of whom were even engaged through the medium of an interpreter — men who did not know "port" from "starboard" in English, and every one must know the extreme danger of such a state of things when prompt measures were required to avoid a collision at sea.

Mr. SAMUDA said, whilst there was a great deal to admire in Mr. Gray's paper, there was very much with which he did not altogether coincide. He thought there was no doubt that Government supervision was, to some extent, desirable, though, if carried too far, it would be injurious. The view he took was that competition and the influence of public approval were the surest incitements to a professional man to induce him to do his best. He thought one great evil in the present day was the love of cheapness which had grown upon the public, and exercised an unfortunate influence in the trade to which he belonged. It thus became very difficult for a man who strictly desired to produce the best ships to do so, when he was liable to be undersold by less conscientious builders. It was only a long career of success that would make a man independent of such competition. It appeared to him, however, that if the public were not by this means alone getting that amount of good material and good workmanship which they really required, then it was only right that the Government should come forward for the protection of the public in a matter of such vital moment. Take the instance of a passenger ship carrying out a large number of emigrants. Those were a class of people, generally speaking, practically incapable of obtaining justice for themselves. A certain amount of air-space and accommodation was necessary for them, and certain general rules had been laid down for their benefit; but this was not all that was required for their safety; the proper means of escape in case of accident ought also to be provided; and here the interference of Government might be valuable in the regulation of the number of boats. This should be according to the number of passengers, and not, as at present, merely according to the tonnage. He believed that legislation upon great principles would be useful; but when it descended to details, it became positively vicious. He could not help thinking that on the whole, as far as steam navigation was concerned, some advantages had arisen to the public from Government inspection. So long as Government confined itself to inspection ship-builders had a strong incentive to go on improving; and they had the opportunity of giving proper development to their own ideas. Therefore he did not think it right to pass a sweeping condemnation upon the whole system of Government supervision and inspection; certainly not when it was confined within reasonable limits.

Mr. WM. HAWES said this subject, brought forward so ably by the gentleman who had read the paper, was only another form of that question which had been recently discussed in that place, as to the alleged benefits to be derived from Government interference, which, in fact, amounted to the transfer of responsibility from the individual to the Government. For his own part, he thought it was better for the public to be satisfied to rely upon the character of the shipbuilder or owner for the excellence of his vessels, rather than upon the responsibility of a gentleman appointed by the Government to inspect them, because it was impossible to suppose that such a person, appointed to those duties some years since, and who had been long in the office, would be so well up in the scientific improvement and progress in shipbuilding as those gentlemen whose whole prosperity depended upon turning out the most perfect form of ship that could be produced. If legislation could successfully be applied in any matter of general industry or commerce, shipbuilding was one in which the public would be naturally inclined to seek for its aid. The sympathies of all were involved in the question, for almost every one throughout this country had friends or relations occasionally trusting themselves to the safety of our ships. But the question was not whether every possible precaution ought or ought not to be taken. The question was whether those precautions would be taken more securely for the public interest by Government officers than by private individuals. Government inspectors were not always appointed for their special fitness, but frequently from political pressure or private friendship. Moreover, such officers might be fit men when they were appointed, but he contended that no man, however fit he might be at the time of his appointment, would be a match for the intelligence and ingenuity of the manufacturer ten or fifteen years after that appointment. It was, in fact, putting the inferior man to look after the superior man, and such an arrangement could not be practically useful to the public. They had been told by the first speaker that the gentleman who had read this paper was a disciple of Mill. He hoped he was, and that there were many others of the same school in that room, because Mill taught them the true principles of liberty, and independence of Government interference. The same gentleman argued that shipowners might be relieved of all anxiety as to pecuniary loss, because they would insure both ships and cargo. But was that the right way in which to consider this question? Would a captain of a ship really go to sea believing that it was to go to the bottom? Was not his life as valuable as those of the passengers he carried? There was no doubt that the captain, officers, and crew were generally anxious to do their duty, and, if possible, to carry the vessel across the sea in safety. But accidents would happen; and then came the question whether accidents happened more frequently in ships which had been built entirely under private surveillance or under the surveillance of the officers of the Board of Trade? The paper went to show that more accidents happened to vessels that had been inspected than to those that had not. The fact was that no person surveying a ship could form an adequate idea of it unless he had seen it built. When the machinery was once on board and fitted in its place, how could the surveyor tell whether the boilers were efficient or not? The public must rely upon the known strength or goodness of the work of the manufacturer, and not upon the inspector's examination. Some years ago, he (Mr. Hawes) was interested in a company which proposed to establish steam communication between this country and Australia, but its operations were very greatly impeded by these surveyors. They did not believe that an iron ship—especially if propelled by a screw—could go to Australia; and it was only with very great difficulty that those ships passed the Board of Trade surveyor. But what would have been the result upon the industry of this country if they had not done so? A great amount of our industry would have been checked, and commercial progres materially impeded. It was absurd to suppose that the improvements of individuals or of manufacturing firms were to be held in check by the preconceived opinions of Government surveyors. He knew there were important cases in which apparently strong claims for Government superintendence were made out, but this was merely because everything connected with the sea enlisted the sympathies of all, and induced many to forget the true principles on which commercial success depended. Government inspection transferred the responsibility from the shipbuilders and shipowners to the Government, and when any negligence arose they screened themselves under

the plea that they had conformed to the Government regulations. It was seldom that official inquiries resulted in satisfactory verdicts. They were almost always one-sided and partial. It might be that the Government regulations had been complied with, but it often happened that a ship was lost from some accident not contemplated by the Government regulations at all, and the official investigation ended in nothing, or at most, in the suspension of the master's certificate, and what punishment was that to the owners of the ship? Let them, in such cases, appeal to the remedy at common law, and where it was proved that owners sent ships to sea in an improper state, let them pay the penalty. There would then be the best possible security that good ships would be sent to sea, which would not be the case so long as we relied upon Government interference, and thus relieved the owners of that responsibility which, by every principle of law and equity, they ought to bear.

Mr. EDWIN CHADWICK, C.B., remarked that for once he agreed, to a considerable extent, with the views enunciated by his friend who had just sat down. If it became a question between the responsibility of self interest on the one hand, and on the other the responsibility induced merely by regulations, he would prefer to trust himself to the former. He would adhere to the responsibility of self interest, but that interest must be a real, solid, close, and pinching interest. Mr. Chadwick proceeded to illustrate his views by reference to the convict transport system, in which, in the first instance, a capitation payment was made on embarkation, and this resulted in the loss of half the convicts put on board; by degrees that loss was reduced to one-third; but when, under the auspices of a new colonial administration, the system was altered to a capitation payment for all the convicts that were landed at their destination, the contrast was very striking indeed, and the owners of the vessels carried surgeons, and the best means were devised for landing the largest possible number at the port for which they were bound. The same results applied, to a very great extent, to pauper emigration. He went on to state that he would not on any account remove this responsibility from the owners of vessels. Official inspection of ships, as to material, construction, and machinery, must necessarily be of a very superficial character. It was impossible to go into minute details, but there were cases in which supplemental provisions would come in aid of the principle of the mere responsibility of self-interest. Comparing the Royal Navy with the mercantile marine, it would be found that the casualties were just about one eighth less in the former than in the latter. He thought a regulation that every ship should carry a sufficient number of life-boats to convey those on board in case of accident (without insisting on any special type of boat), would not be objected to by the shipping interest. On the subject of insurance a good deal might be said. He thought to a certain extent it had tended to impair the whole character of our mercantile marine. As long as a ship was insured the owner became careless what sort of crew he put on board, and what sort of ship he fitted out. It was the fact, however, that a large number of ships were sent out uninsured, and there was no doubt that such ships were very much better manned than those which were covered by insurance.

Mr. CLIFFORD WIGRAM said, as a large ship builder and owner, he had probably seen more of the working of the Acts of Parliament, alluded to in the paper, than most persons present, and his own experience had been that they had not operated prejudicially to the interests of such shipowners as were fully desirous of doing their duty. Speaking for his own firm, he would say they had never been requested to add a single precaution to any of their ships; they had always anticipated every demand of the kind. He could not but think, however, that the valuable part of Government superintendence was the protection it afforded to an honest shipowner, desirous of doing his duty, but who, perhaps, did not himself know a great deal about ship building, and was obliged to trust very much to the builder whom he employed to build him a first-class ship at the lowest tender. A first-class ship was a very indefinite thing; and he thought that Government inspection, which stepped in for the protection of life, was very valuable to the owner who was anxious to do his duty to the passengers he carried. He had been struck with the fact that nearly the whole of the discussion had been upon iron ships. They had heard a good deal about bulkheads, which could not be placed in wooden ships.

Mr. GRAY said several of the wooden ships of the City of Dublin Company were fitted with bulkheads, and Mr. Samuda remarked that this was not an unusual thing.

Mr. WIGRAM would say he had never seen bulkheads fitted watertight in wooden ships; besides, they involved points of weakness in other respects. The stringent points in Government inspection were those which related to the safety of life; the goods might very well be left to the owners to protect, but when life was concerned it was a different matter, and he did not think the requirements of the Government surveyors were such that any shipowner ought to object to them. Something had been said upon the question of cables and anchors. If an owner was desirous of having a good cable, and paid a fair price to a first-rate manufacturer, he was pretty sure to have a good article; but if he contracted for a cable at a low price he must expect to get an inferior one, and the underwriters might be the sufferers in the end. On the question of underwriting it had been said that when a ship was sent to sea fully insured, the tendency was to make the owner indifferent to the result. He thought that was a false view of the case. All large shipowners knew that if they owned ten or twelve ships the cheapest thing was not to insure at all. In his own firm the premiums on their ships would amount to between £4,000 and £5,000 a-year, and as, until the late loss of the *London*, they had not lost a ship since the year 1809, it might be calculated whether it was worth while to insure their ships, or to send them to sea so equipped as to enable them to escape as far as possible the risks which large owners were content to take upon themselves.

Mr. FARRER, as having had a good deal to do with the carrying out of the Act of Parliament referred to, was anxious to know what was meant by the suggestion of Mr. Samuda, that the Government regulations should be confined to principles and should not extend to details. Did that mean that the Board of Trade were to have an arbitrary power to say what should be done? Were they to send an officer to say, "You shall have such compasses, such boilers, and such safety-valves?" He would say, for his own part, he decidedly objected to taking any share in the regulation of such matters.

Mr. SAMUDA explained that what he said was the reverse of that. He would not have interference with details; but if a ship was found to be unseaworthy she must not be allowed to go to sea.

Mr. FARRER did not see how a proper inspection could be made without going into details. Mr. Wigram had said a good shipowner did even more than the Government required. He was aware of that fact, and that formed one of his objections to this sort of legislation. Legislative rules on this subject must always be of the *minimum*, and not of the *maximum*, and the evil was that a legislative *minimum* had always a tendency to become practically a *maximum*. Then, again, it had been sometimes argued that it was desirable that one shipowner should be protected against others of a less honourable character. That would involve a protection to the good article in the shape of a Government brand of excellence. Such a thing had been proposed, but it appeared to him to be founded upon a wrong principle. After all they must look to self interest, and not to Government regulations, as the great element of the safety of life on board ship. The point he would press upon the meeting was that there were two principles and

two ways in which they could act for this object; one was to leave the shipowner, the builder, and the engineer free to choose their own means, and make them responsible for the ends; or else they might dictate the means, and then they must relieve those parties from the responsibility of the ends. They could not oblige a shipowner to put in such a number of bulkheads, or such a kind of safety valve, and then, if the ship was lost, blame him for not making proper provisions for her safety. The principle of common law was to make the builder responsible to the owner, and the owner responsible to the passengers whom he carried. It must also be borne in mind that if an owner sent an unsafe ship to sea he could not recover on his policy of insurance. But this principle was inconsistent with those rags and tatters of protection with which we had been clothing the giant of British industry for years. We must adopt one course or the other—either on the one hand appoint a numerous staff of surveyors, and thus relieve the shipowner of the responsibility, or we must say, "choose your own means, but we require you to produce a safe and proper ship." On this subject no less an authority than Mr. Anderson had stated before Mr. Lindsay's committee that he wished the Government to appoint such persons as they thought proper to examine ships, and to give certificates; but after that the owner should be free from all liability. That would be a legitimate consequence, although he thought Mr. Anderson was wrong in that recommendation. With regard to what had fallen from Mr. Hawes as to the character of official inquiries into the causes of the loss of vessels, he (Mr. Farrer) thought it was a proper function of the Government to throw all the light possible upon the causes of an accident, let the consequences to the owner be what they might. Mr. Hawes argued that these inquiries were followed by no result, but he (Mr. Farrer) did not find it so when ship-owners were before the Board of Trade. They had no objection to statutory regulations, but when it came to inquiries which rendered them liable to penalties and damages they did not much like such inquiries. Whenever a great casualty occurred at sea, an outcry was raised that something must be done, but he thought one of the two principles must be adopted, either the shipowner or the Government must be made liable; they could not take an intermediate course.

Mr. Henry Maudslay said there were cases in which Government inspection was desirable. An engine manufacturer might send out from his works engines of the best description and efficient in every respect, but they would not always last so. They might get into hands in which they would soon be destroyed, and in such cases Government inspection would properly come into play. A vessel also might be constructed upon the best known principles of the period at which it was built, but it might not continue so good. Anchors and chain cables might be furnished by the best makers and the highest prices paid for them, but extreme strains might be brought upon them, and a frosty day might affect the cable to such an extent that it would break under a strain that it would have borne in the summer time. After a cable had been subjected to extraordinary strains in heavy gales it ought to be proved again. It was the same with vessels, which required periodical inspection. Having pointed out the desirability of periodical inspections of engines, Mr. Maudslay remarked that, notwithstanding the presumed vigilance of the inspections in America, surreptitious means were adopted to evade the statutory regulations; and he mentioned a case in which a weight had been attached to the bottom of a safety valve inside the boiler, so as to deceive the inspector. When a boiler was sent to France, the first act of the French Government Inspector was to drill a hole through it, in which he inserted a plug of metal, which would melt at a certain temperature; but that precaution was sometimes evaded by the engineer causing a little jet of water to squirt upon the plug, and prevent its heating to the point of melting. Upon the whole he thought that a certain amount of Government inspection was desirable and necessary.

Admiral Sir Edward Belcher offered some remarks upon the period of the first introduction of water-tight compartments in vessels, stating that, in 1818, he laid that form of construction before the Admiralty, and it was carried out in the *Erebus* and *Terror* in 1835. About that time ships were fitted by the Admiralty with five transverse watertight compartments, with the addition of longitudinal bulkheads for security in case of collision. With regard to lifeboats, it was a misnomer to apply that term to the boats generally carried by ships; they doubtless had a certain amount of buoyancy, but they were not entitled to the appellation of lifeboats.

Mr. Campin remarked that Mr. Hawes had alluded to the common law liability which attached to shipowners and others, but he had omitted to say who was to pay the costs which attended proceedings at common law, and in the case of poor emigrants, the means of carrying on a prosecution against a shipowner were very slender indeed.

Capt. Jasper Selwyn, R.N., having spoken upon points of construction, in reference to the wreck of the *London*, remarked that, upon the general question of responsibility, he might instance the action of the law with regard to drunkenness and other offences, where the means of detecting an offender was not by sending a policeman to watch how many glasses of liquor he had taken and then punishing him, but if it was proved that he was actually drunk, he was punished for being so, without inquiry into the cause. He thought the same principle might be applied to the present case. If the responsibility were placed upon the shipowner, and loss of life occurred from a wreck, the old principle of the English law was to inflict a penalty or "deodand," unless it could be shown that the disaster was occasioned by what was called "the act of God," or, in other words, was one that no precaution could provide against. In cases where three-fourths of the crew were foreigners, not even known to the captain of the ship, or when a ship had been overloaded and the ordinary precautions against danger had been disregarded, he would make the owner responsible. With reference to the statement in the paper as to the large number of wrecks that had taken place on a particular part of the coast, which in the majority of cases were attributed to neglect of the use of the lead, he would state that an eminent engineer and electrician had devised a plan by which the approach of a vessel into shoal water was indicated without the use of any lead whatever. If any definite principle could be laid down in reference to responsibility, he submitted it should be that which he had just enunciated, viz., that the owners and commanders of vessels—not their subordinates—should be held responsible. So long as the owners and commanders of ships felt this responsibility, their vessels were well managed; but the instant that responsibility was removed by Government interference, the evils so ably pointed out by the author of the paper were the inevitable result.

Mr. C. F. Young entertained no doubt as to the desirability of some kind of superintendence and inspection. The first thing was to devise a proper mode of surveying ships, and the next was to see that it was properly carried out. In respect of the first point, Lloyd's committee had prepared elaborate tables and rules, and on the next it had been found, in the case of some Galway ships, on their arrival at the mouth of the Thames, that they wanted reconstructing, so that it was evident some improvement in the system was required. Self interest was very well, but there were the self interests of two parties to be considered, viz., that of the purchaser, who desired to get the article at the lowest price, and that of the seller, who endeavoured to get the largest amount of profit at that price, and the results of these clashing interests were in most instances most unsatisfactory to the public. He believed proper superintendence under well considered rules would be a great benefit.

Mr. Webber was in favour of the utmost possible amount of supervision on the part of the Government, especially in the case of large ship loads of poor emigrants. He related circumstances which had come under his personal knowledge in respect of the bad provisioning of those ships, the captain and steward having sheltered themselves under the plea that the whole of the meat had been inspected by a Government officer, who, however, had evidently not done his duty.

Mr. Thomas Gray, in reply, stated that he had listened to the discussion with attention and anxiety; at that late hour it would be impossible for him to review the pros and cons in detail; but he would say, on the general point, that with all his attention, and all his anxiety, he had failed to discover that any really sound and valid argument had been adduced in favour of statutory provisions respecting the construction and equipment of ships. Those who argued in favour of it appeared to him to argue in this defective manner:—Your ships and lives are lost, therefore statutory interference in constructive details is necessary. Whereas their argument ought to be, first, ships and lives are lost; secondly, statutory details would prevent these losses; and thirdly, therefore these details are necessary. That the interference would be beneficial must be proved before its necessity could be admitted; and his point was, that this benefit, the minor premiss in the perfect syllogism, had not been proved. Mr. Gray then reviewed the Emigration Acts, and contended that their real value did not consist in clauses requiring a ship to carry a chronometer and a compass, but in those clauses which gave the poor emigrant a speedy, safe, and expeditious remedy for damages. He then reviewed the American statutes, and contended from them that safety is not the handmaiden of supervision. He then referred to the *Garryowen* and the *Great Britain*, built without any supervision, and compared them with the celebrated Galway boats built when the system of Government nursing was at its height, and challenged the comparison in favour of unrestricted trade; he concluded by thanking those present for their patience and the kindness and impartiality of their criticisms.

The Chairman said he could not but express his deep regret at the absence of the right hon. gentleman (Mr. Lowe) who was to have presided on this occasion, for they would no doubt have had from him a brilliant speech, characterised by that wide information, power of logic, and weight of authority which he carried with him, whereas, from him (the Chairman) they could expect nothing of the kind. He further regretted Mr. Lowe's absence because, if he had been present, it would have afforded a spectacle which could be seen alone in this of all countries—that of an ex-member of the Government presiding at a meeting at which an officer of the Government was doing his best to bring into discredit the principle of governmental interference, and to show that in matters connected with the commerce and industry of the nation, the people of this country preferred to do without that Government interference, and in such matters felt themselves capable of governing themselves. He also felt that he owed the meeting some excuse for occupying the position he now did. He took an interest in this question, partly as an old sailor, or rather semi-sailor. In the second place as an officer of the Government, and as one who had been employed in a somewhat complex inquiry, in the course of which nothing had impressed itself so clearly upon his mind as the utter absurdity of Government pretending to regulate any branch of industry. Some few years ago he was a member of a Royal Commission of inquiry into the fisheries of the kingdom, and a more marvellous illustration of the blunders which the Government committed when it meddled with a branch of industry, could not be given than the results of those inquiries. He would mention only one or two instances. Our Government had entered into an agreement with the French authorities, after a great deal of discussion of the subject, that our trawling vessels should not carry a trawl beam more than a certain number of feet long. This was thought to be a wise regulation; but by great good luck nobody ever took notice of the Convention Act, and when the inquiry was made of the trawl owners what would have happened if the regulation had been obeyed, they replied that they would have been prevented from increasing the size of their vessels, which, in the progress of their trade, they had done to a considerable extent, for the trawl beam naturally had a relation to the size of the vessel. If this regulation had been carried out, it would, in fact, have crippled and paralysed that particular branch of trade. A more curious instance still occurred on the coast of Scotland, and showed what might happen when Government "put its finger into the pie." There was a place where large quantities of herrings deposited their spawn, and the Government had forbidden the trawlers fishing at this spot, because there appeared to be a fear of their scraping up the spawn. When this was inquired into, however, and the fishermen were asked what induced them to go to that particular place, the reply was "Because we find an enormous quantity of flat fish there." They were asked, "What do these fish go there for?" The answer was, "To eat the spawn of the herrings;" and so this admirable Government regulation had led to the destruction of twenty times as much spawn as the trawls could possibly have injured. It was the strong impression which the whole course of that inquiry had engendered in his mind as to the injurious effect of every kind of Government interference with trade, which led him to attend this evening to hear what had been so well said by the author of this paper. There was another capacity in which he took an interest in this subject, viz., as a man of science, for though men of science were, perhaps, "wise in their generation," they were not always wise outside of it. He had observed of late that the Royal Society, of which he was a member, and which deserved in its sphere every respect and veneration, had, he thought, recently travelled somewhat out of its course in endeavouring to thrust upon the Government certain regulations on a nautical subject, by appealing to popular feeling. They had led the Government to enter into matters which involved questions as yet unsettled, either in the Royal Society or elsewhere, and in reference to which, even if settled, it was in the highest degree doubtful whether any Government regulation would be effectually carried out. He wished to enter his protest against the course taken by the Royal Society in this matter. Upon the general question which had been discussed he would merely say the whole subject resolved itself into a theory of government—whether the Government in this matter was to be a king or simply a system of police for punishing wrongdoers. From what he gathered in the discussion he came to the conclusion that it was the opinion of the majority of the speakers that the "police" theory was the right one. Some, it was true, thought they should like a little of the "king," but not much. He concluded by proposing a cordial vote of thanks to Mr. Gray for his paper, which having been carried,

Mr. Gray briefly acknowledged the compliment.

Proceedings of Institutions.

Liverpool Institute.—Mr. Charles Sharp, librarian and assistant-secretary of the Pharmaceutical Society, and co-editor of the *Year Book of Pharmacy*, has been elected secretary of the Liverpool Institute, and of Queen's College, Liverpool, in the room of Mr. Astrup Cariss, who has resigned this office, after having filled it for more than eleven years.

Fine Arts.

The Loan of Works of Art.—A bill has been printed and brought into the House of Lords, by Lord Stanley, of Alderley, providing that the owner for the time being of any work of art may, without incurring any responsibility for any consequent loss or injury, lend such work to the Lord President for the time being of her Majesty's Privy Council, for any period not exceeding twelve months, to be exhibited to the public by him or by his directions at the proposed exhibitions of national portraits, and the Universal Exhibition of Paris next year. The Lord President is to take due precautions for the preservation of all works of art lent to him in pursuance of this Act, but he is not to be personally liable for any loss or injury any article may sustain. The expression "owner for the time being" will include trustees of museums and other bodies of persons, whether corporate or unincorporate, having in their possession or under their control works of art, on trust for any public purpose, or for any artistic or scientific society, or possessed thereof on behalf of themselves and their successors; it will also include any tenant for life or other person entitled (otherwise than as mortgagee or as trustee for creditors) to the possession or enjoyment of works of art and science for life or any other limited period.

Obituary.

William Thomas Brande, D.C.L., F.R.S., the well-known chemist, died on the 11th inst. He was born in 1786, and was grandson of a physician who came from Hanover with George II., and was that king's physician. After an education at Westminster, he was sent to Hanover; but in 1803, on the panic of Napoleon's invasion, he returned home, and entered St. George's Hospital, attending the lectures and the dissecting-rooms, and communicating several papers to *Nicholson's Journal*, notably one on guiacum, which was read before the Royal Society. In 1808 he examined the calculi at the Hunterian Museum, and lectured on chemistry at Dr. Hooper's, in Cork-street. Then he became connected with the new medical school in Windmill-street, and embarked as a teacher and demonstrator of chemistry. In 1809 he became F.R.S., received the Copley medal in 1813, and from 1813 to 1826 was Dr. Wollaston's successor as senior secretary of the Royal Society. In 1812 he became a professor of chemistry and Materia Medica to the Apothecaries' Company, and in 1851 was elected master. In 1813, on Sir H. Davy's recommendation, he was appointed professor of chemistry at the Royal Institution, and delivered lectures for many years in connection with Faraday, who was also long associated with him as editor of the *Quarterly Journal of Science*. In 1825 he was appointed superintendent of the die department of the Mint; in 1836 Fellow, and in 1846 Examiner, of the London University. Besides Professor Brande's famous "Manual of Chemistry," which has been translated into many foreign languages, he was author of "Outlines of Geology," "Dictionary of Science and Art," &c. In 1853 he received the honorary degree of D.C.L. from Oxford University.

Notes.

The Site of the Exhibition of 1862.—In the House of Commons, on Friday last, in reply to a question by Mr. C. Bentinck, as to what course the Government intended to pursue relative to the vacant ground in South Kensington and the erection of a building there; and whether any Bill was to be introduced this session for the removal of any of the collections now forming part of the British Museum, the Chancellor of the Exchequer said that the intention of the Government was to pass two votes for the disposal in part of the site acquired at South Kensington. One was for the erection of a building for the reception of the collections from the British Museum, and the other for a building for the reception of the collections of the Patent Museum. With respect to the introduction of a Bill this session for the removal of collections at the British Museum, that would not come on until they had disposed of the previous vote. But until they knew when they would be in a condition to obtain that, he would not be able to state the time when the Bill would be introduced.

Correspondence.

Freehold Land Societies.—Sir,—I have a perfect recollection of the interview with Mr. Beggs prior to the Social Science Congress. I gave him no figures verbally, but he had, I believe, our printed prospectus and reports, in which there are no traces of the general results of the meeting of the Conservative Land Society mentioned in the paper which he read to the Society of Arts. Mr. Beggs promised to send me the proof of the paper he proposed to read at the Sheffield Congress, and if he had done so, no such "singular inaccuracy" could have been made, as the one (I am willing to believe from some unaccountable misapprehension) he fell into—it appears at Sheffield as well as in London—which only met my eye after reading the report in your columns of the meeting at the Society of Arts. Mr. Beggs wishes your readers to infer, to account for the striking difference in the figures, that between the amount specified so erroneously there had been another report, that is, between August or September up to January, our receipts had amounted from £394,966 to £902,561 12s. 11d. This must have been assuredly an astounding progress, but the society cannot claim credit for such an imaginary issue of four months' operations. I am quite ready to acquit Mr. Beggs of an intentional misrepresentation, but I think, in his position as a director of the National Land Society, he ought to have been more careful in his statistics. I regret the inaccuracy the more, because, had I been present at the meeting of the Society of Arts, which I fully intended to have been, I should have been prepared to support, by some interesting statements, the main principle laid down in Mr. Beggs' paper, that in order to secure for the working classes healthy and cheap domiciles, no attempt should be made to pet and patronise, but that the intelligence and industry of the operative should have full play, that his thorough independence should be guaranteed, and that he should obtain his dwelling in healthy localities, at low rents, on his own freehold, by his own exertions, the mutual principle in the land or building societies being used in such a way that their commercial success in providing the sons of toil with houses, should be a guarantee to them that they were not dependent on eleemosynary aid.—I am, &c.,
Charles Lewis Gruneisen, *Secretary to the Conservative Land Society*.

33, Norfolk-street, Strand, Feb. 11, 1866.

To Correspondents.

Letters from Sir Edward Belcher and Mr. Tarbotton have been received, but are not inserted this week for want of space.

MEETINGS FOR THE ENSUING WEEK.

Mon......Society of Arts, 8. Cantor Lecture. Mr. Fleeming Jenkin, F.R.S., "On Submarine Telegraphy." (Lecture V.)
R. Geographical 8½. Mr. W. Chandless, "Exploration of the River Purus."
British Architects, 8.
Actuaries, 7. 1. Mr. W. P. Pattison, "On organization,

and its application to assurance companies." 2. Rev. Walter Mitchell, "On dual arithmetic."
TUES....Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. Edwin Clark, "The hydraulic lift graving dock."
Zoological 8½.
Ethnological, 8. 1. Sir John Lubbock, Bart., and Mr. Fredk. Lubbock, "On the true assignation of the bronze weapons, &c." 2. Mr. John Crawfurd, "On the origin and history of written languages."
Royal Inst., 3. Professor Frankland, F.R.S., "On the non-metallic elements."
WED.....Society of Arts, 8. Report by the Secretary, "On the results of the Art-Workmanship competition, from its commencement."
THURS...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. Herbert Spencer, "On circulation and the formation of wood in plants."
Chemical, 8. 1. Mr. C. R. Wright, "Chemical action of sunlight." 2. Prof. Church, "New Cornish minerals."
Royal Society Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Professor Frankland, F.R.S., "On the non-metallic elements."
FRI......Royal Inst., 8. Mr. G. Scharf, "On Portraiture."
Philological, 8.
Archæological Inst., 4.
SAT......Royal Inst., 3. Rev. G. Henslow, "On systematic and structural botany."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 10th February, 1866.*

3. Charitable Funds—Return.
5. Small Pox in Sheep—Order.
10. Public Debt—Account.

Delivered on 12th February, 1866.

1. Bills—Qualification for Offices Abolition.
2. ,, Railway Travelling (Ireland).
4. Cattle Plague—Copies of Nineteen Orders.
4-1. Ditto (Order 9th February, 1866).
7. Russian-Dutch Loan—Account.
8. Sardinian Loan—Account.
9. Greek Loan—Account.
Cattle Plague—First Report of Commissioners.

Delivered on 13th February, 1866.

4. Bills—National Debt Reduction.
5. ,, Savings Banks and Post Office Savings Banks.
7. ,, Cattle Plague.
14. Australian Mail—Contract.

Delivered on 14th February, 1866.

6. Bill—Cattle Diseases.
6. Irish Reproductive Loan Fund—Account.
11. Mint—Account.
Cattle Plague—Second Report of Commissioners.
Russia—Report of Present State of Trade between Great Britain and.
Poor Relief (Scotland)—Twentieth Annual Report.

Delivered on 15th February, 1866.

8. Bills—Pensions.
18. ,, Juries in Criminal Cases.
1. Public Income and Expenditure—Account.

Patents.

From Commissioners of Patents' Journal, February 16th.

GRANTS OF PROVISIONAL PROTECTION.

Aniline green—3374—E. J. Hughes.
Arsenic—121—B. Todd.
Artificial flowers—242—W. Clark.
Asphalted felt—262—R. A. Brooman.
Augurs—32—W. E. Newton.
Bassinettes, stands for—292—E. R. Wethered.
Beds or mattresses for shipboard—120—H. F. Smith.
Blast engines—363—R. Gatley.
Boots and shoes—246—J. Piddington.
Buffers and draw and bearing springs—294—L. Sterne.
Buttons from plastic materials, making—244—L. D. Phillips.
Carriages, breaks for—277—G. de Witte.
China clay, &c., treatment of—200—C. G. Penney.
Coke—260—T. Drane.
Coke ovens—349—C. D. Abel.
Drapery goods, &c., measuring and blocking—325—W. Bosse.
Dressing bags, travelling or fitted—329—H. Mitchell.
Electric clocks—136—A. V. Newton.
Engines for ascending steep inclines, locomotive—284—A. Chaplin.
Fabrics, covering the edges of—238—G. Hinchliffe.
Fabrics in bobbin net machinery, making—221—W. Hodgkinson.
Fabrics, washing, &c.—280—B. Farmer.
Fibrous materials, softening—268—W. Justice and E. Guild.
Floor cloths, printed—278—W. Hessee and G. Smyth.
Fur, &c., treating—264—A. V. Newton.
Gas meters—274—W. W. Pocock.
Graving dock—190—W. E. Gedge.
Handwriting, sheets, &c., for improving the—170—J. Williams.
Horses' feet in frosty weather, portable appliances for—125—J. Har
Hydraulic steam hammer—312—H. A. Dufrené.
India rubber, &c., treating—360—W. R. Lake.
Lathes, &c., holding details for—337—W. Mackintosh.
Liquids, cooling—302—J. Miller and J. Pyle.
Liquids, distilling—70—J. M. Macrum.
Liquids, registering the flow of—375—J. Lewis.
Liquids, vessels for drawing off—315—B. Candler.
Mechanical valve respirator—339—W. Hibbert.
Metal, boring, &c.—3362—W. Harrison and T. Walker.
Motive power—181—W. Clark.
Motive power, obtaining—291—J. G. Tongue.
Oils, distilling and refining—319—J. B. Grant.
Ordnance and carriages—298—C. O. Staunton.
Pianofortes—248—H. Cooper, T. Dutfield, and A. Gibson.
Plugs—365—W. S. Cluderay.
Railway bars—260—W. H. Barlow.
Railway carriages, metallic cases for spiral springs for—239—J. Evans.
Railway carriages, wheels of—182—R. E. Kaulbach.
Railway engines, &c., vulcanised india-rubber springs for—18—J. Spencer.
Railway rolling stock, lubricating—365—T. J. Smith.
Railway trains, communication between the passengers, guards, and engine drivers of—255—P. E. Waddell.
Red colouring matter or dye—641—J. Holliday.
Screw propeller—17—H. Hirsch.
Sewing machines—331—G. Barker and C. Davis.
Ships, cleansing the bottoms of—252—H. Gardner.
Ships, securing the hatchways of—343—E. M. Leeds.
Stays or corsets—3238—W. Pretty.
Steam boilers—310—W. and J. Woodward.
Steam boilers—177—R. Clark.
Steering apparatus—321—A. Murray.
Spinning, mules for—335—J. and P. Warburton, and S. Barnes.
Sugar, refining—162—M. F. Anderson.
Textile fabrics, making and dyeing—345—F. B. Baker.
Torpedoes—379—C. A. McEvoy.
Trousers, &c., means of supporting—361—J. Jones.
Weavers' healds—282—W. R. Harris.
Weaving, looms for—250—J. A. Castree.
Weaving, looms for—333—J. J. and E. Harrison.
Weaving two cloths at one time, looms for—3311—L. D'Aubréville.
Window fastenings—254—D. Jones and J. Upton.
Windows, rack pullies for roller blinds for—180—W. Parsons.
Wood, cutting holes or mortises in—377—A. Clark.
Wrought iron tubes—305—H. A. Bonneville.
Yarns, printing—210—J. Stringer and G. Birch.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Liquid sewage to land, applying—421—J. Pilbrow.
Rudders, working—405—G. D. Davies.
Vices—457—W. R. Lake.

PATENTS SEALED.

2132. M. Cartwright and A. Dale.	2256. W. Clark.
2140. A. Watt.	2705. E. E. Middleton.
2173. J. Moody.	2856. J. Whitworth.
2198. B. D. Hodgson.	2869. W. E. Newton.
2199. R. G. Rattray.	3018. J. Whitworth.
2200. G. T. Bousfield.	3172. A. V. Newton.

From Commissioners of Patents' Journal, February 20th.

PATENTS SEALED.

2158. J. Lockwood.	2212. E. Davies & R. H. T
2162. D. O. Jones.	2232. T. Wrigley and M. Westhead.
2163. J. G. Avery.	2259. C. Horsley.
2164. G. Little.	2260. J. Lake.
2167. J. Newton.	2298. A. Duvernois.
2168. L. J. Levisohn.	2303. A. Mackie and J. P. Je
2169. D. Macpherson.	2375. M. Henry.
2174. D. Davies.	2438. W. E. Newton.
2184. E. A. Curley.	2454. A. V. Newton.
2187. C. A. Watkins.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

12,466. T. C. Clarkson.	499. J. Clay.
393. G. Wrigley and S. Morris.	456. J. J. Badart.
412. J. Morgan.	505. W. Hooper.
417. W. C. McEntee, and G. and T. Withers.	738. J. Saunders and J. Piper
388. J. Jones.	443. J. H. Bly.
485. W. H. Gauntlett.	448. G. T. Bousfield.
615. W. Whittle.	464. C. W. Siemens.
424. W. Nalder.	482. A. Dugdale.
	507. E. R. Walker.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

451. C. Garton.	445. T. Cattell.
528. G. Horner.	468. G. Paul.

Journal of the Society of Arts.

FRIDAY, MARCH 2, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

MARCH 7.—"On the late Anglo-French Exhibition, with a Proposal for the formation of an Anglo-French Association." By ROBERT CONINGSBY, Esq.

MARCH 14.—"On Visible Speech, or a Universal and Self-interpreting Physiological Alphabet. By ALEXANDER MELVILLE BELL, Esq., F.R.S., S.A. On this evening Alexander J. Ellis, Esq., F.R.S., will preside.

CANTOR LECTURES.

A Course of Lectures by Dr. F. Crace Calvert, F.R.S., will commence in April. Particulars will be duly announced.

NATIONAL PORTRAIT EXHIBITION, 1866.

Season Tickets for this Exhibition are now ready, and may be had at the Society of Arts, on application to the Financial Officer, price £1.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The Committee met on Wednesday, January 10th, 1866. Present—Henry Cole, Esq., C.B., in the chair, Sir John E. Harington, Bart., Messrs. S. Redgrave, R. K. Bowley, and R. F. Puttick.

Mr. HENRY LESLIE examined by the committee:—

614. I believe, Mr. Leslie, you are the principal of the National College of Music?—Yes; during the time of its existence. It is about to be discontinued.

615. How long is that?—Two years.

616. It would appear from the prospectus that its aim was similar to that of the Royal Academy of Music?—It was instituted for the purpose of giving a musical education on the basis of the foreign Conservatoires.

616. Its aim was to teach music generally?—Yes.

617. Did the National College of Music rely wholly on the fees of the students for support?—Not at all.

618. Were there subscribers?—The main expense was undertaken for two years by the Marquis Townshend. It failed for want of funds, no one having come forward to assist financially upon the expiration of the guarantee of Lord Townshend.

619. Was there a great loss?—It was not a question of paying or not, but the giving of the best possible instruction. I had the power of granting any extra lessons I deemed fit to ensure the improvement of the pupils.

620. The point which the committee wish to arrive at is, assuming everything was done that was considered necessary by the principal and managers, what was the cost as compared with the results in that college?—There was a loss upon each pupil; a considerable loss upon some.

621. The Marquis Townshend himself stood in the place of a body of subscribers?—He undertook the whole expenses for two years.

621*a*. The Marquis Townshend having given it up, and no one coming forward to support it, it falls to the ground, unless the State or some other body comes in and takes the place?—Yes.

622. Did you find pupils in sufficient number in the National College of Music to call for the services of the very efficient staff of professors which you seem to have had?—We had only four violin pupils, all the others being for singing and the pianoforte.

623. You did not find many pupils for wind instruments?—There were candidates sufficient, though few showed the amount of natural talent which the council deemed necessary to entitle them to gratuitous instruction.

624. You did not admit them unless they showed some talent?—No; when we found decided talent, sooner than lose it, we educated it gratis during our existence. The greater number of the pupils we had could not afford the usual fee, viz., twenty-one guineas for the first class, and fifteen for the second.

625. You are of opinion that any institution of this kind to succeed must receive aid beyond the fees of the pupils?—Most decidedly.

626. And you found the pupils, generally speaking, persons who were not able to pay the fees required for their musical education?—Yes.

627. The answers you have given imply your agreement with the opinion that there is great necessity for a national academy of music in this country?—An absolute necessity, if music is to be cultivated as an art.

628. Have you had any personal experience with regard to the foreign conservatoires?—None at all.

629. Will you be good enough to favour the committee with your notions of what you would wish to see done by an academy of music?—On the question as to the necessity for a national academy of music I would say the establishment of such an institution could not fail to exercise an enormous influence upon the musical talent of the country, as it would be the means of enabling students to become something more than teachers. To accomplish the production of artistes a far greater amount of instruction and study is necessary than any existing institution can afford from the present scale of fees.

630. What do you consider the average period of time that a student should remain in the academy?—Five or six years.

630*a*. Will you proceed to give the committee your further notions of what the academy should be?—A national institution should be under the control of the Government. Individual responsibility should be the guiding principle. There should be a director appointed—a professional man—with supreme authority, responsible only to the Government or its representative. The director to appoint five chief professors, viz., for harmony and composition, pianoforte, stringed instruments, wind instruments, and singing, each responsible to the director for the management of his department. These five professors to appoint sub-professors in their respective departments. There should be instrumental and choral practice. A theatre should be attached to the institution in order to prepare students who intend going on the stage. Examinations should take place every three or six months, and pupils who have not made satisfactory progress should be dismissed. Musical degrees could be conferred by the academy.

631. You think the present system of conferring musical degrees wrong?—I do.

632. You would prefer that musical degrees should be conferred by a responsible musical academy?—By an academy which should be the centre of musical education in England. The general education of the pupils ought not to be neglected. In no case whatever would I allow a pupil to accept a single engagement during his term of pupilage, although there might be difficulty in carrying that into practice, because some of the pupils might not be able to maintain themselves without taking occasional engagements.

633. Having read the proposals that have been laid before the committee by Mr. Cole, will you be good enough to give the committee your opinion upon them?—With regard to the management of the institution, I would not have the lay element in it at all.

634. Except as paymasters?—I think it would be a bad principle.

635. If a liberal grant were made by the Government, it would be necessary that the Government should be in some way represented in the management of the institution and in the expenditure of the funds?—Yes, certainly; I see no objection to that.

636. Supposing Parliament granted an adequate sum of money, and entrusted its expenditure to a minister of the Crown, the minister might find it necessary to fortify his opinion by the advice of other parties who need not necessarily have a voice in the executive management, but would still be able to advise the representative of the Government whether the thing was going on rightly, he himself knowing nothing of the matter practically?—Yes.

637. There must be some control over the management not of a professional character?—To the extent you say. I can see no objection to such control.

638. Your opinion is that there should be individual responsibility in every department?—Yes; that should be the guiding principle in everything.

639. You have no doubts as to the benefits of such an institution?—Nothing satisfactory can be done without it.

640. You do not consider it creditable to the English nation to ignore music?—It is much to be deplored that the finest musical capabilities are thrown away for want of such an institution as there ought to be.

641. As regards musical artistes and the tuition of music generally, do you consider we are improving as a country, or getting worse?—With regard to tuition, I think we are improving; but, with respect to artistes, we are retrograding.

642. Notwithstanding the increasing demand the quality supplied is not of an improved character, you think?—Certainly not.

643. You attribute that to the want of a settled system of musical education?—Not altogether. Take, for instance, the case of a young man studying singing. The moment he is in a position to earn two or three guineas a week by engagements, his position is generally such that he is obliged to take them. It is almost impossible to hope for any artistic result in such a case. His education unfinished, his style is deteriorated, and the greater his musical capabilities the more serious is the danger.

644. It therefore becomes the more important, with an increasing demand on the part of the public for music, to take measures for creating a high quality and standard of music in this country?—Undoubtedly. It is my firm conviction that an institution carefully organized, and properly supported by the Government in England might be made the finest thing of its kind in the world. We have the best masters, and musical talent of a very high order; but it is frittered away in a deplorable manner, simply because there are no means of getting a really artistic education at a moderate cost.

645. You think music is not to be treated upon the ordinary principles of free trade—that it should educate itself?—Yes; music has been lowered from being completely ignored by the Government and being treated more as a trade than as an art.

646. Have you any acquaintance with the state of music in this country in the early time of Elizabeth?—Only from the compositions of the period.

647. Is it your opinion that composition has improved since that time?—Decidedly it has.

648. Are not the public importunate to get the best music they can, without taking pains to produce the very best?—They must take the best that is offered them.

649. You think musical ability is to be found in all parts of the kingdom?—Certainly.

650. You have had considerable experience in provincial associations for the practice of music?—Yes.

651. Do you think that those local societies could be brought into useful connection with the Academy?—I cannot say. The societies in question are of a choral character—as at Birmingham, Manchester, Bradford, &c. These may be a means of educing local talent, but great talent, wherever it exists, is sure to be brought forward through local connections of some kind or other. Almost all towns—indeed many villages—now have a choral society for the practice of music.

652. You would not bring them into connection with the academy?—I do not see any practical means of doing so.

653. You think without any such system you would get the talent?—I believe so.

654. Can you conceive the practicability of a system by which musical ability, not from a large town, but from a small town or village, could be sent up to the academy to be tested, and returned back if found wanting, and cultivated if found deserving?—There would be many more applications than could be taken.

[Mr. COLE explained the system pursued in this respect in the Training Schools of South Kensington, which, he said, after many years' experience, had worked extremely well.]

Mr. LESLIE—It is a question of detail which it is hardly necessary for me to enter into. Any facilities you give to persons to come up would increase the number of applicants.

655. Were you educated at the Royal Academy?—I was a private pupil of the present principal of the academy, Mr. Charles Lucas, and my father being a subscriber to the institution from its commencement, I used to take part in the practices of the students by invitation of the director.

656. Reverting to your own institution, should you say it was an experiment which proves the hopelessness of establishing such an institution without Government aid?—To my mind it demonstrated that no such institution, without Government aid, can fulfil the requirements of an English musical artistic education.

657. Do you think the English tax-payer would submit to the payment of an adequate grant from the public funds?—I must leave that to be answered by some one more experienced that I am in the ways of the individual in question.

658. You think private support of such an institution has been sufficiently tested?—I think quite so: such a system has been in vogue at the Royal Academy during forty-three years.

659. Yours was an experiment on a different principle, which equally proves the correctness of your opinion?—My opinion is formed upon the fact that the National College, instituted solely to aid talented and deserving persons, failed to elicit public sympathy and support.

660. Notwithstanding there is a growing demand for and appreciation of music throughout the country?—I should like to see six more tenors like Mr. Sims Reeves, and half-a-dozen more baritones like Mr. Santley.

661. Do you think that number would find sufficient employment?—Certainly; I have no doubt about it.

662. You heard the evidence of Mr. Costa?—Yes.

663. Do you generally concur with it?—Almost entirely; more particularly as to a uniform style of teaching in every branch of the Academy.

664. You think the comparative failure of the Royal Academy of Music is to be attributed to the want of individual responsibility and individual management?—I do not know enough of it to say that. The want of a uniform school of instruction is undoubtedly a very serious objection. A pupil leaves the institution, not with an Academy polish, but with the method of his master, hence, after more than forty years, there is no such thing as individual Academy style.

665. That would be the fault of management?—I merely speak of the result. There is no uniformity of style.

666. You think a distinct school of music a desideratum?—Yes; decidedly.

667. And you apply that to all the teaching?—Yes; as a ruling principle.

668. In your opinion the musical director of the Academy should be solely responsible and should have the sole control of the musical education; he should give his own style and feeling to the musical education of the Academy?—Yes; the director should have supreme authority, and be held responsible for the proper carrying out of every arrangement connected with the education of the students.

669. With regard to the admission of amateurs into the academy, do you think the teaching of the academy should be limited to those who intend to make music their profession in life?—I do not see that you have any right to draw such a distinction. If a person pays his fees I don't see that you have any right to question him on the subject.

670. Do you think it desirable to limit the education to professors only?—It would be absurd, I think, to attempt to do so.

671. Do you think any jealousy would be created if you gave such teaching in the academy as might interfere with the private tuition of music?—If you put forth a prospectus, stating that upon certain conditions a person may enter the academy as a pupil, I think you have no right to ask to what purpose the education is to be applied. Many men walk the hospitals and attend lectures without any intention of becoming surgeons.

672. Do you not think it desirable to regulate the fees paid by students according to their circumstances in life?—That is a very different matter. With regard to the National College it is stated in the prospectus that, "Although the scale of fees is very moderate, the council have the power of assisting those showing remarkable talent, by granting a lower scale of payment by the establishment of scholarships, and even by gratuitous instruction under peculiar circumstances." It is only right that I should state that nearly every applicant for admission was deemed by friends to meet the privilege of being classed as one "under peculiar circumstances."

673. With regard to the opportunities for composers hearing their own music performed in the way it ought to be; is there not a great want of such opportunities?—Certainly.

674. And would not a theatre attached to the Academy be a great advantage for that as well as other purposes?—Decidedly.

675. And would it not equally apply to *artistes* for the stage?—Quite so. With regard to composers, the moment a musical work is completed the difficulties of a composer commence. A great musical work cannot be produced, particularly if there are choral parts in it, at less than about £200 expense, irrespective of finding the music. A room for hearing the works of composers would be a great boon to that class. A theatre would be most valuable in preparing pupils for the stage. Some of the most distinguished *artistes* of the day have had to learn their business on the stage in the presence of public audiences.

676. Do you concur in the opinion that has been generally expressed before this Committee, that it is better to try and reform the present Academy than to start an entirely new institution in opposition to it?—I have not thought at all on that subject.

677. Do you not think, in the circumstances under which the Royal Academy was founded, there would be almost insuperable difficulty in creating a new establishment in opposition to it?—I think you must first see what may be done by the government before you can judge of the extent to which you may be able to reform the existing Academy. Finance is the great question.

678. Do you not think it possible to amend the Academy so as to make it virtually a new institution?—Then it would be a new institution.

679. You are not opposed to the present title of "Royal Academy?"—Not to the name. I only object to the system which has prevailed.

Cantor Lectures.

"On Submarine Telegraphy." By Fleeming Jenkin, Esq., C.E., F.R.S.

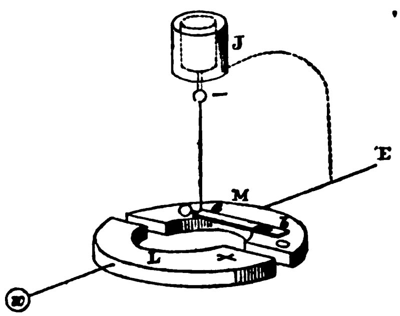
Lecture V.—Monday, February 26.

Electrical Tests.—(*Continued.*)

1. *Testing Short Lengths.*—It was shown in the last lecture that whenever a current could be observed traversing a conductor or an insulator, the resistance of the conductor or the insulator could be measured in definite units; but when it is desirable to test a very short length of insulated wire, the methods hitherto described are not available. The resistance which is opposed by the insulator is then so great as to prevent the passage of any current which can be detected even on the most sensitive galvanometer. A distinct class of tests must then be applied, which, as will presently be shown, give the same information as the tests by the direct observation of currents, and even indirectly give the resistance of the insulator in the same units. All are probably familiar with some of the properties acquired by a body charged with statical electricity by the electrical machine, such as the power of at first attracting light bodies and then repelling them when they are similarly electrified, &c.; few will have attempted to repeat these simple experiments without discovering that there is much difficulty in retaining the charge of electricity, as it is called; no sooner has the pith ball or the brass knob acquired the desired properties than they are lost by leakage along the insulating glass stems or silk threads. The insulation required for these experiments is of exactly the same nature as that required for submarine cables, the leakage down the glass stems is due to conduction, just as the leakage from a submarine cable is due to conduction through the insulator; and the current or quantity of electricity conveyed away is often in both cases too small to be shown by a galvanometer. It is not difficult, however, to observe how long the body charged keeps its peculiar properties, and this time is itself a measure of the goodness of the insulation, or, in other words, of the magnitude of the resistance which the insulator offers to the passage of the current. We may, therefore, charge a short length of cable with statical electricity, and observe the time required to allow that charge to fall to say half its original amount. The gradual fall of the charge may be observed by an electrometer, an instrument specially adapted to show the tension or potential, as it is called, of an electrified body. The rudest of all these instruments is the common gold leaf electroscope, and roughly we might test a short insulated wire by charging it while the conductor is connected to the gold leaves, and the insulator is dipped into an uninsulated basin of water; if the gold leaves at once collapse the insulation is bad; if they remain long divergent the insulation is good. But no two gold-leaf electrometers are alike, nor are they in any way adapted for exact measurement. Peltier's electrometer would give somewhat more accurate indications. The needle repelled by the brass knob would deflect to a given number of degrees, and its gradual return could equally be observed in degrees and fractions. The deviations are not, however, proportional to the potentials producing them, and most Peltier's electrometers are constructed without any expectation that they should be used for accurate measurements. They require, moreover, a very high tension to show any effect whatever. Professor William Thomson has, to obviate these defects, designed various electrometers, of which the divided ring electrometer is, perhaps, the most convenient for testing cables. It is constructed on the following

principle:—A light flat aluminium needle *a b*, Fig. 1, balanced by a counterpoise, is suspended by a platinum wire from a point connected with the interior coating of a Leyden jar. Under the needle two half rings, L and

Fig. 1.



M, are placed, with the division on one side directly under the aluminium needle in its position of rest. The whole is placed inside a metal case, not shown in the drawing. Suppose the needle *a b* not to be charged, then, if L be connected with *x*, an electrified body, while M is connected with the earth, the needle will turn slightly towards L, and this will be the case whether the electricity of *x* be positive or negative. If we now charge the Leyden jar with, say negative electricity the needle will be brought to the same potential as the inner coating; it will be much more strongly attracted than before by L if the electricity of *x* be positive, and would be powerfully repelled if *x* were negative. If *x* loses its electricity and returns to the potential of the earth, the needle *a b* will return to its original indifferent position between L and M, being equally attracted by both. One object of connecting the needle with a Leyden jar is to provide a considerable supply of electricity for the needle, so that the unavoidable slight leakage which must occur may not affect one test or even a series of tests. A loss of one unit of electricity per minute will matter little if the whole store be one thousand, such as may be held by the jar; but if the store be only one or two units, such as would be received by the needle, such a loss would be fatal. The deflections will also be greater and the instrument will be more sensitive the higher the potential to which the jar is charged, but the indications will only be constant so long as the jar is charged to the same degree. In the instrument, as made, the deflections are shown by a spot of light reflected from a mirror hung above the needle as in the reflecting galvanometers. The Leyden jar is placed in an atmosphere dried by sulphuric acid, and will hold a sensibly constant charge for days at a time. Finally, the metal case screens the needle from all attraction or repulsion by bodies electrified outside, owing to a well-known law. The deflections, being angularly very small, are proportional to the potentials of the bodies to be tested, which are connected with L; while M is kept permanently in connection with the earth. With this instrument, nothing is easier than to compare accurately the times occupied by the charged conductor of a piece of cable covered with water in falling from the first tension to half or any other fraction, and the times thus occupied are relative measures of the insulation resistance of the insulating cover. No very high tension is required, and the test by this instrument gives one direct proof of the identity of electricity given by friction and that from the voltaic battery. In making the test the cable may be charged by a spark or two from a machine or electrophorus, or it may be charged by simple contact for an instant with a wire joined to one pole of a voltaic battery of say 50 or 100 elements. It will readily be understood that when we know how fast a reservoir of given capacity em[pties] itself by a given pipe, we may calculate the resis[tance] which the pipe has opposed to the passage of the w[ater]. Such a calculation would, with water, be much [more] complicated than with electricity; and the follo[wing] formula gives the means of calculating, in B.A. unit[s, the] resistance of the insulator. When the potential [P at] the beginning, and p at the end of a time t, measur[ed in] seconds, are known—

$$(7.)\quad R = \frac{t}{S \log._{e} \frac{P}{p}}$$

Or,

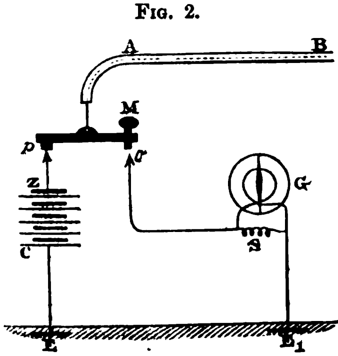
$$(8.)\quad R = \frac{0{\cdot}4343\, t}{S \log. \frac{P}{p}}$$

In the first of these equations the hyperbolic, and i[n the] second the ordinary logarithm of $\frac{P}{p}$ is used, but in bo[th we] have a quantity S, called the capacity of the cable, [the] meaning and measurement of which will be pres[ently] explained.

Testing Joints.—One use of the test described is to [test] the joints of insulated wires. When the conductor [of a] cable is joined in the ordinary way to a battery or oth[er]wise electrified, any leakage which may be observ[ed] may be due to the whole or any part of the insulat[or], and no test of this kind proves a joint separate from [the] rest of the cable, and the general leakage from a lo[ng] cable is comparatively so great, that it may entir[ely] mask a very slight flaw at some one point, such [as] a joint. A joint may be tested by dipping it i[n] an insulated trough connected with one pole of [a] battery, while the other pole and the cable co[n]ductor are joined or connected with the earth. A[ny] current which is then observed must pass thro[ugh] the insulator in the trough, and the test become[s a] test of one spot only; but a joint may not be as g[ood] as the rest of a cable, and yet have so high a resist[ance] as to show no current in this way. A more searchi[ng] test is given by the use of the electrometer. Dip [the] joint in the insulated trough as before, and connect [the] trough with the test plate L. (Fig. 1.); electrify [the] trough by a machine or electrophorus, and watch [the] gradual loss by leakage into the cable at that p[oint]. The conductor should be connected with the e[arth. It] is of course essential that the trough itself should [be] very perfectly insulated during this experiment; a[nd a] similar remark applies to all tests of short lengths [of] insulated wire. In unpractised hands the loss [by] moisture on the surface of supports, dirty keys, [and] other connections, will generally be much gre[ater] than the loss which it is desired to meas[ure]. Conduction along the surface of ebonite, used for instruments, and along the surface of the gutta-pe[rcha] or other insulator under test, can be partly preve[nted] by extreme cleanliness; but an artificially dried at[mos]phere is necessary in all cases where extremely [high] insulation is required; as, for instance, for the Le[yden] jar of Professor Thomson's electrometer or the tr[ough] to test joints. The ends of a short wire to be te[sted] should also be freshly cut. Ebonite, after being i[n use] for instruments for some time, often requires to be fre[shly] polished. As an example of what can be don[e by] selecting proper materials, and by drying the at[mos]phere, so as to prevent a moist film from being [de]posited on the surface, the lecturer can, from his [own] experience, state that Leyden jars, in Professor T[hom]son's electrometers, can be made to hold their charg[e so] well that not one half per cent. will escape in 24 h[ours]. Such a cable as the Atlantic falls from charge to [half] charge in about fifteen minutes. Some wires, co[vered] by Hooper's material, fall from charge to half charg[e] from seven hours to two days.

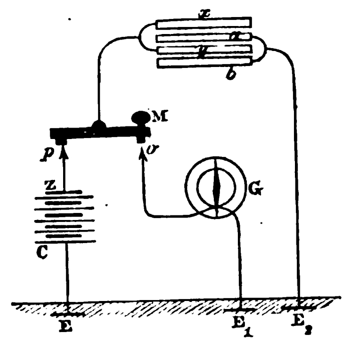
3. *Induction Tests.*—Hitherto the word charge has been used as having a sense with which all are familiar, and the indications of an electrometer which really measures tension or difference of potential from the earth, have been received as evidence of a greater or smaller charge; it is time to justify these expressions. The charge of electricity which an insulated body will receive really means a definite quantity of electricity. This quantity, when escaping to the earth, which is assumed to be at zero tension, produces a current equal to the quantity divided by the time occupied in its escape. Bodies are said to contain equal charges, when these charges will produce in their discharge equal currents. A charge held by a body is said to be at a certain tension or potential, meaning the quality measured by the electrometer above described. The total charge which a given body in given circumstances will receive is proportional to the potential or tension to which it is raised. Thus, the charge produced by contact with the pole of a battery of fifty cells is fifty times that produced by a single cell. The tension or potential produced by a frictional machine is of exactly the same nature as that produced by the voltaic battery; it is simply greater in amount. Thus a body may be charged equally by sparks from an electrophorus, and by a voltaic battery; then if this charge be allowed to escape through a galvanometer, the current in each case will be equal, and produce an equal deflection; and, again, if two bodies are charged to the same potential, say by contact with one pole of the same battery, then if the current produced by the discharge from the two be equal, the charges on both were equal, and the *capacity* of both bodies was equal. The capacity of a body for receiving a charge depends on many elements; it increases as the external surface of the body increases, and it increases as the surrounding bodies in connection with the earth are brought near to the insulated electrified body. Thus the capacity of a Leyden jar, where the inner electrified surface is large, and close to the outer unelectrified surface, is much greater than that of a sphere of equal surface in a large room. The general laws regulating capacity and potential are too complex to be here explained; the capacity of a cable increases directly as its length, just as the capacity of two equal Leyden jars is double that of one. The gutta percha acts the part of the glass; the copper that of the inner tinfoil; the water or moisture outside represents the outer uninsulated coating. Owing to the large surface and slight thickness of the insulation, the capacity of a long cable is very great, and its discharge can be shown on almost any galvanometer; the discharge from a yard can be seen on a sensitive instrument if charged by, say 100 Daniell's cells. Fig. 2 shows the connections required to show the

FIG. 2.



discharge. M is a common key, by which the conductor of the cable A B can be first placed in connection with the battery Z C by a contact at *p*, and then removed from the battery, and immediately connected at *o* with one terminal of a galvanometer, G, the other terminal of which is in connection with earth at E. The contact at *p* charges the cable, and that at O discharges it through the galvanometer. It will readily be seen that as the quantity which goes into the cable must be equal to that which leaves it, if the galvanometer G were placed between Z and *p*, it would be affected to the same extent by the entrance of the charge as by its exit at *o*. With a well insulated cable, deflections due to the rush in or out of the charge are far greater than that due to leakage across the sheath, and it is to avoid the disturbance due to this momentary current that in making insulation tests, no sensible part of the current is at first allowed to run through the galvanometer, but is conducted through a short circuit as at *o*, Fig. 2, lecture IV. The deflection due to the charge or discharge of a short cable is the result of a single very short impulse, and this deflection may be used to measure the charge in two ways. First we may make a standard knot of cable or Leyden jar, or condenser, as it is sometimes called; we may take the discharge from that, as in Fig. 3, where *a b* represent plates

FIG. 3.



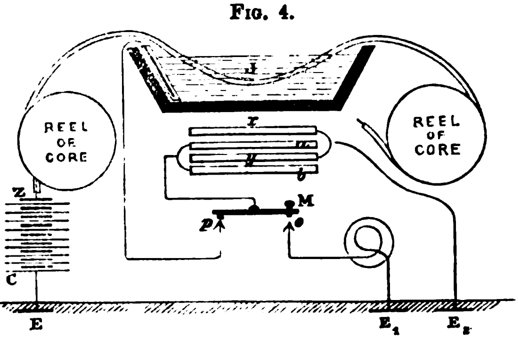
in connection with the earth, and *x y* insulated plates separated from them by mica, gutta-percha, paraffin, glass, or air, the other connections being the same as in Fig. 2. Next we may charge the cable from the same battery, and by trial bring the galvanometer to the same deflection by shunting part of the current through coils, which can be adjusted; if $\frac{1}{100}$th part of the current pass through G, then the capacity of the cable is one hundred times that of the condenser; the relative charges, if not differing much, may be taken as proportional to the deflections on a reflecting galvanometer, or, more strictly, to the sines of half the angles on any instrument. A galvanometer with a comparatively heavy needle is better for this purpose than a reflecting instrument with mirror and light magnets, owing to the resistance of the air. The comparison of capacities may be made in a much more accurate manner by various less well-known devices; as, by the transfer of a charge from one condenser to another, and the measurement of the potential before and after the transfer; by the relative effect of two discharges in opposite directions through a differential galvanometer; by balancing a succession of discharges through one coil of a differential galvanometer against a permanent current adjusted with the aid of resistance coils; and by balancing the discharges against a permanent current in an arrangement resembling a Wheatstone balance. These arrangements have, it is believed, not yet been used as practical tests, but it will be useful to give here a formula by which we may compare the results of any two or more observers, who have not got galvanometers which they have compared, or condensers of known relative capacities. Let S be the capacity of a conductor measured in the units required for equation 8; let t = half the time of a complete oscillation of the needle of the galvanometer under the influence of terrestrial magnetism

alone, i = the angle to which the needle is thrown by the momentary current, R_1 = the resistance in B A units of the circuit through which the battery used to charge the cable would produce the unit deflection on the galvanometer, then

$$(9.)\quad S = 2\,\frac{t \sin \frac{1}{2} i}{\pi R_1}$$

The accuracy with which this measurement can be made is not very great, owing to the difficulty of measuring t on most instruments. The charge is said to be due to induction, and these tests are called induction tests; it now remains to show their practical application. The discharge may be used to measure insulation, thus: charge the cable by contact at p (Fig. 2.), and then break contact at p without making contact at o; the charge which is as it were bottled up inside the cable, leaks gradually through the gutta-percha. After, say one minute, make contact at o, and observe the difference between the deflection thus obtained and that obtained when the cable is discharged immediately after being charged. The difference measures the loss in one minute. The galvanometer can in this way, by successive trials, be used to ascertain the rate at which the charge is lost, for all the tests described above as measured with the electrometer, though less conveniently. A similar test is applied by Messrs. Bright and Clark to the testing of joints. A joint (Fig 4) is placed in an

FIG. 4.



insulated trough of water connected with a condenser, the battery is applied to one end of the cable, and any slight leakage which may occur at the joint gradually accumulates in the condenser. After a minute or more the condenser is discharged through a galvanometer, which may then show the result of a minute's accumulation even when the permanent current passing at any moment would not have been sensible. But these are only the indirect consequences of the induction test. Its main object is to compare the capacities of various cables, and the inductive properties of various materials; and the reason why these points are important is, that the number of words which can be transmitted per minute through long submarine cables is, *cæteris paribus*, inversely proportional to their capacity. So that a long cable A, each knot of which will, from a given battery, receive only half the charge received by cable B (equal to A in other respects), will transmit double the number of words per minute. The cause of this cannot here be explained, but the fact is experimentally and theoretically proved. By theory, the charge on equal lengths of two wires, covered with the same insulator, should be inversely proportional to log. $\frac{D}{d}$ when D and d as before indicate the diameter of the insulator and conductor; but the capacity also varies with the insulator used, thus the charge on a knot of the Persian Gulf cable, insulated with gutta-percha, was 35 per cent. greater than a knot of similar dimensions insulated by Hooper's material, and was somewhat more than four times greater than the charge would have been had it been possible to find an insulator with the properties of air instead of gutta percha. The property of a material in virtue of which it affects the charge is called its inductive capacity, and the ratio of the charge induced when the solid material is used, to that which would be induced if air were the insulator, is called the specific inductive capacity of the material. It will be seen that equation 9 gives the means of expressing the capacity of a knot of cable in certain units. Table XIII. gives the calculated capacity of some cables and materials in these units, with the specific inductive capacity of gutta percha, india rubber, and Hooper's material. These numbers are very much less well ascertained than the resistance measurements given in previous tables. Nevertheless improvement in this quality is of very much greater importance than improvement in insulation resistance. Neither temperature nor pressure seems to affect the charge or capacity of cables very materially.

4. *Tests to Detect Faults.*—Faults in cables may be classed as follows:—1. A fracture or interruption in the copper conductor, which, nevertheless, remains insulated inside the gutta-percha covering. 2. A fracture of the

TABLE XIII.—INDUCTION TESTS.

Name of Cable.	Material.	S = Electro-magnetic capacity per knot, multiplied by 10^{12}	s = Electrostatical capacity per knot, in absolute measure. French.	Specific inductive capacity per foot, $I = 3{\cdot}281 \times \frac{2s}{6087} \log._\epsilon \frac{D}{d}$ English.	Source of Information.
Malta-Alexandria	Gutta-percha	0·0399	3583	4·18	Calculated from value of I, given by F. Jenkin. Report on Electrical Instruments, Class XIII., International Exhibition, 1862.
Atlantic cable	Gutta-percha	0·0345	3340	4·3	Condenser adjusted by Mr. Willoughby Smith. Experiments by F. Jenkin and Chas. Hockin.
Persian Gulf cable	Gutta-percha	0·0323	3120	4·2	Condenser adjusted by J. C. Laws. Experiments as above.
Hooper's cable, Persian Gulf pattern	Partly vulcanized India-rubber	0·0239	2310	3·11	Compared by Prof. W. Thomson, and independently by Messrs. Bright and Clark, with Persian Gulf gutta-percha cable.
	Masticated India-rubber			2·82	Jurors' Report, International Exhibition, as above.

copper conductor and gutta-percha, in which a considerable length of copper wire remains exposed to the water. 3. A fault intermediate between the first two, with copper and gutta-percha both broken, but little copper exposed. 4. A connection between the iron covering and the copper by a nail or wire driven in. 5. A hole or imperfection in the gutta-percha sheath, establishing a connection of considerable resistance between the conductor and the sea. The first of these faults is of course followed by a total cessation of all electrical communication between the two ends of the cable. Its position may be detected in two ways. The charge which the cable will contain may be measured as above described, and if the charge per knot is known, the charge observed will directly give the distance of the break, and the accuracy with which the position of the fault can be determined is limited only by the accuracy with which the relative charges can be compared; the cable is an insulated Leyden jar, the capacity of which is simply proportional to the length of the conductor from the shore to the fault. So that if the discharge from a knot of the cable, with a given battery and reflecting galvanometer, is represented by a deflection of ten divisions, and the discharge from a cable containing a broken copper conductor is 100 divisions, we may feel certain that the fault is about ten miles from shore. By the more accurate modes of comparing discharges, the distance of a fault of this kind, even on a long cable, might be accurately found. The method by the throw or deflection of a needle is not applicable to a very long cable, because of the time occupied by the discharge; the theory of the formula given above, supposes that the needle moves under a sudden impulse, very short compared with the time of oscillation of the needle. A second plan of determining the position of this kind of fault is to measure the resistance of the insulating sheath. Thus, if we know by the discharge-test that the cable is insulated where broken, and find the insulation resistance to be 1,000 units, whereas the insulation resistance of one knot is 1,000,000 units, we may conclude that the fault is 1,000 miles off, as it will require one thousand miles of sound core to give so small a resistance as 1,000 units. Faults of this kind are very rare where strands of copper properly jointed are used. The second kind of fault enumerated also wholly stops communication between the two ends of the cable, and almost invariably occurs when a cable is broken with violence. The copper and gutta-percha are then both stretched, and the gutta-percha springs back when the copper breaks, and leaves the latter exposed; but sometimes the copper breaks some little way from where the gutta-percha yields and inside it; then the third kind of fault occurs intermediate between the two former. When some inches of copper are exposed, a connection of small resistance is formed with the sea. In this case the resistance of the copper conductor, measured from the shore, measures the distance of the fault; we know the resistance per knot, and if we observe 500 times this resistance the fault is 500 miles off, the resistance of the earth itself being nil. A small correction ought of course to be made for conduction through the insulator when sound, but in good cables this may be neglected. It is by this test that the operators at Valencia are able to tell that they have still the full length of cable between them and the spot where the cable was first broken. There is little difficulty in determining whether a fault of this nature has occurred, for the comparatively small resistance of the cable shows that it is connected with the sea where it ought not to be, and the constancy of that resistance shows the connection to be complete. This brings us to the third class of fault, where the connection between the sea and copper exists, but is imperfect, or due to only a small area of exposed copper. The fault itself, then, possesses considerable resistance, sometimes more than that of all the copper conductor of the cable, and, what is worse, this resistance is inconstant, varying rapidly and capriciously between extremely wide limits. The test for resistance in that case simply tells us that the fault cannot be beyond the distance corresponding to the smallest resistance observed. The fourth kind of fault corresponds almost exactly in behaviour to the second, but the connection with the sea is still more perfect; the resistance will vary still less, and there will be a total absence of the feeble currents which result from the copper and iron of a cable when broken and separated by salt water. Earth currents, due to a difference of potential between the shore and sea, at the fault, may of course, in both cases, be observed. The fifth kind of fault is easily detected; there is a considerable fall in the insulation resistance, and a slight or moderate fall in the apparent resistance of the copper conductor between the two stations, but messages can still be transmitted, as a portion only of the whole current, inversely proportional to the resistance of the fault, escapes into the sea. If one station insulates the cable, and the other measures the resistance, the fault behaves like a fault of the third class, and this test will not detect its position. If, however, the resistance of the fault remain constant, and two measurements of resistance, R and r, be made from station A, when station B respectively insulates the end of the cable and connects it with the earth, we obtain two equations concerning the resistances, in which there is only one unknown quantity, viz., the resistance of the fault. When this is eliminated, the following equation is obtained:—

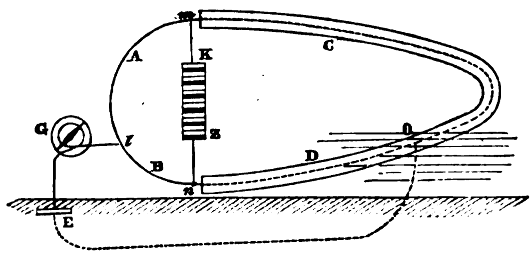
$$(10.)\quad D = r - \sqrt{(R - r)\,(L - r)}$$

where D = the resistance of the conductor between the fault and the observer, and L = the resistance of the whole conductor between the stations. On very long cables a correction for the effect of the uniform leakage through the insulator would be necessary, but this correction fades into insignificance in comparison with the error introduced by the supposition that the resistance of the fault will remain constant during the two tests. Successive tests from the two stations, the distant end being insulated in each case, will also give two equations, by which, on the same supposition, that the resistance of the fault remains constant, its position can be determined. Then calling R and R_1 the resistance in the two cases, we have—

$$(11.)\quad D = \frac{L + (R - R_1)}{2}$$

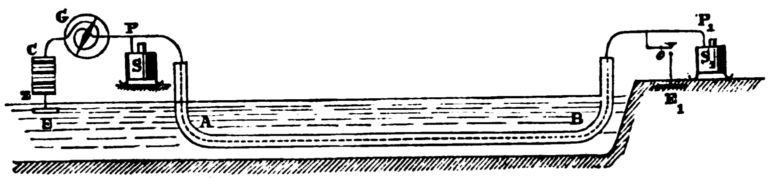
when D is the resistance of the conductor between the station which observed the resistance R and the fault. This test labours under the same defect as the previous one. When a return insulated wire can be substituted for the earth, so that the observer has both ends of a complete metallic circuit before him, the position of a fault, such as is described, even of varying resistance, can be accurately determined by more than one method. Mr. Varley uses a differential galvanometer, a well known instrument, to ascertain when an equal current runs into both ends of the metallic circuit, and out at the fault. This will only be the case when the resistance between the galvanometer and the fault is the same by both roads; this condition is easily fulfilled by adding resistance coils between one coil of the galvanometer and the defective wire. The resistance which must thus be added to bring the galvanometer to zero is obviously equal to twice the resistance of the metallic conductor between the fault and the distant station. Prof. Wheatstone's balance may be so arranged as to give another method, by making the connections as in Fig. 5, where the fault, supposed to be at o, forms, as it were, part of the galvanometer wire. In this case, as in the preceding, a variation in the resistance of the fault does not affect the result; it will cause a greater or less deflection in the galvanometer until the desired balance is effected; but it will not alter the relative resistances of the several parts of the main circuit required to reduce the deflection to zero. The test in Fig. 5 is

Fig. 5.



made by adjusting the relative resistances of A and B; until no deflection is obtained; then the fault will be at a point such that $\frac{A}{B} = \frac{C}{D}$ where C and D represent the resistance of the conductor separating *m* from the fault and *n* from the fault. When the total resistance of the conductor is known, this will give the position of the fault very accurately. Mr. John Murray, of Glasgow, is said by Professor Thomson to have first applied this test on board the *Niagara* during the first Atlantic expedition. It was re-invented by the lecturer, and may be used to detect very small faults even on short lengths. It is now only necessary to describe one more plan of determining the position of a fault of this nature by a simultaneous test at both stations, or on board ship and on shore. This plan is Professor Thomson's, but it was also re-invented by the lecturer after seeing Mr. Smith's test, described in lecture IV. This re-invention is not very remarkable, as the lecturer owes the chief part of his theoretical instruction in electrical science to Professor Thomson, and is familiar with his instruments and methods, but as this is, he believes, the first publication of the plan, he thinks it well to state these circumstances. The connections required are shown in Fig. 6, where G is a galvanometer; S, an electrometer at the same station; S_1 an electrometer at a

Fig. 6.



distant station, where the end of the submerged cable AB is insulated. The battery CZ is connected with the other end of the cable. Then let C = the current observed on the galvanometer, V the potential at the same station, U the potential at the distant station, l = the length of the cable, K the resistance of the unit lengths of the conductor, *n* the resistance of the unit length of insulator to conduction across the sheath, and let $\sqrt{\frac{K}{n}} = a$. All these quantities may be known, and should be measured in the so-called absolute units, or other equally coherent system. Let λ be the distance of the fault from the ship, or galvanometer station, then:—

$$(12). \qquad \lambda = \frac{1}{2a} \log._\epsilon \frac{F}{D}$$

When

$$F = V + \frac{K}{a} C - U \epsilon^{a l}$$

And

$$D = U \epsilon^{-a l} + \frac{K}{a} C - V$$

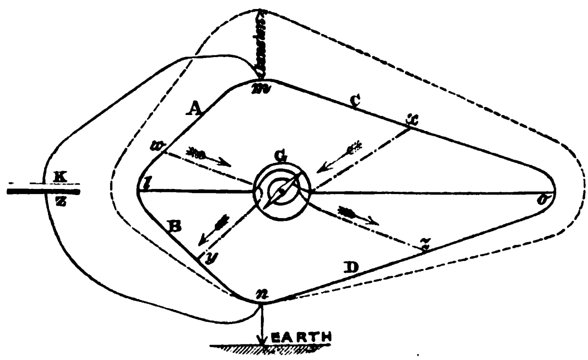
Undoubtedly this test is not of so simple a nature, that it could be executed by an ordinary clerk, but it is interesting to know that a test does exist by which even a fault of this description, which has hitherto baffled electricians, can have its position fixed with mathematical certainty. This is the more important as the connections shown in Fig. 6 are precisely those which are in the lecturer's opinion, the best adapted for tests during the submersion of a cable. The marine galvanometer G would give one test of insulation, the electrometer S a second one, the electrometer S_1 a third test on shore. The shore would speak to the ship without causing a suspension of the insulation test either on S or G, and even when the ship speaks to the shore the electrometer S will maintain the insulation test, as it is not affected like the galvanometer by the rush of the current in and out of the cable as it is partly discharged or additionally charged by the withdrawal or addition of part of the battery power. The electrometers have, on the same grounds, a superiority over the galvanometers in their behaviour, under the influence of earth currents or the rolling of the ship. But in favour of Mr. Willoughby Smith's plan, it must be conceded that more operators can at present be found who are familiar with galvanometers than with electrometers; so that clerical errors would not be so likely to occur with his plan as with that just described. The lecturer concluded by saying that he might have shown many pretty experiments with powerful magnets, long sparks, coloured tubes, &c., but he had been anxious to show experiments by which real work was done rather than the more amusing or striking features of electrical science; and he begged to thank the audience for the kindness with which they had listened to his endeavours.

APPENDIX III.

Explanation of Wheatstone's Balance.

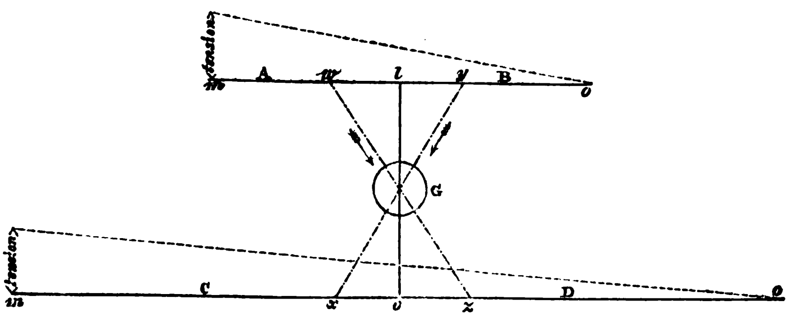
Fig. 7 shows the connection of this arrangement, in which the letters are similarly arranged, and have the same meaning as in Fig. 1, Lecture IV.; but a dotted line has been added surrounding the four conductors A B C and D, and these have been joined to earth at *n*. Let us suppose the galvanometer wires to be removed from l and *n*; the ball K of the battery will produce a maximum tension at *m*, and this tension will gradually decrease round both conductors A B and C D, to nothing at *n*, as would be shown by an electrometer such as is above described. Moreover, this tension decreases precisely in proportion to the decrease of resistance between any given point and earth; so that if the wires A B C D were straightened out as in Fig. 8, and the resistance represented by their length, the fall of tension along each wire would be exactly represented by the height of the dotted straight line shown above each conductor, the maximum height being supposed to correspond to the full tension of the battery. The current in the two wires would of course be very different, but half way along each the tension would be equal to half the maximum; at two-thirds of the distance it would in each wire be two-thirds of the maximum, and so on. Now if two points of the conductors, at equal potentials or tensions, are joined by a wire, no current will pass along that wire, for a current

Fig. 7.



is always due to a difference of tension acting like a head of water; the case is analagous to that of a pipe joining two reservoirs; if the water in each be at the same level no current will flow through the pipe, no matter how deep the reservoirs may be, so that if the galvanometer wires are applied to two points so chosen that $\frac{A}{B} = \frac{C}{D}$, the tensions at those points being equal, no current will pass through the galvanometer. But if the wires

Fig. 8.



are applied as at y and x, a current will pass through in the direction of the arrow, and if the wires are applied, as at z and w, a current in an opposite direction will pass, so that by trial we may always ascertain the exact points at which the condition $\frac{A}{B} = \frac{C}{D}$ is fulfilled. The dotted line round ABCD in Fig. 7 corresponds to the dotted line in Fig. 8, and represents the gradual fall of tensions. When the galvanometer wires are applied, as at y and x or w and z, this dotted line should be slightly modified, but the modification will not affect the truth of the above reasoning.

The Chairman (Mr. Wm. Hawes) said he could not allow this course of lectures to close without asking the audience to thank Mr. Jenkin for the singularly able and lucid manner in which he had treated a subject of great difficulty. It was evident not only that the lecturer was thoroughly master of all the intricacies of the science of electric telegraphy, but also that he had devoted the greatest care to prepare such a course of lectures as should convey to his hearers as much knowledge as possible in the few evenings placed at his disposal. He (the chairman) had, in former years, been a pupil of Faraday, and he could not but say that he had never been so strongly reminded of that unequalled lecturer as by the clear and simple addresses of Mr. Jenkin. This was the more remarkable, as he believed this was the first occasion on which that gentleman had lectured to a general audience. He would conclude by conveying, on his own part and that of the Council—and he felt sure he might add, on that of the audience there assembled—their hearty thanks to Mr. Jenkin for his lectures.

Thirteenth Ordinary Meeting.

Wednesday, February 28th, 1866; William Hawes, Esq., F.G.S., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Abbott, Joseph William, 163, New Bond-street, W.
Brown, Allan McLaren, 269, Camden-road North, N., and Marlee, Blairgowrie, Perthshire.
Condy, Henry Bollman, Devonshire House, Battersea, S.W.
Lomax, J. J., Proprietary School, Hereford.
Stepney, Cowell, 9, Bolton-street, W.
Tabraham, Robert, Bellevue House, London-road, Worcester.
Walker, Robert, 10a, King's Arms-yard, Moorgate-street, E.C.
White, Henry Nathaniel, 83, Albion-road, Dalston, N.E.

The following candidates were balloted for, and duly elected members of the Society:—

Brock, James, 21, George-street, Portman-square, W.
Fretwell, John, 24, Mark-lane, E.C., and 8, Upper Homerton, N.E.
Howard, Raymond, 29, King-square, Goswell-street, E.C.
Patry, James, 7, Cambridge-terrace, Regent's-park, N.W.
Rutson, John, Newby Wiske, Thirsk, Yorkshire.
Salt, Titus, Jun., Saltaire, near Leeds.
Shoolbred, Frederick, 51a, Portland-place, W.
Turner, Cornelius, St. James's-road, Old Kent-road, S.E.

Wickham, William, 33, Tavistock-street, Covent-garden, W.C.

The Secretary read the following—

REPORT ON THE ART WORKMANSHIP PRIZES.

As the time has arrived when the issue of another programme for Art Workmanship prizes must be determined upon, I have been instructed by the Council to draw up a short report on what has been done since these prizes have been established.

Early in the year 1863 a communication was received from the Society of Wood Carvers asking the aid of the Society of Arts in promoting the art of wood-carving in this country; and the Council agreed to allow the use of the Society's rooms for the purpose of holding an exhibition of wood-carving. The Council also agreed to offer the Society's Silver medal, and to make a grant of £30, the Society of Wood Carvers giving £15, to form a fund for prizes to be awarded on that occasion. Employers or private owners were allowed to exhibit, but *boná-fide* workmen only were eligible for prizes. The terms and conditions of the competition were laid down by the Society of Arts and the Wood Carvers jointly, under three divisions, as given in the column headed 1863, in the Table annexed to this report.* This exhibition and competition took place in the month of June, and was followed by the general competition, which took place in the following autumn. At the close of the Exhibition of 1862, the attention of the Council had been drawn to the position of art industry in this country, and it appeared to them that the supply of skilled artizans in the various branches of it was not in so satisfactory a condition as could be desired. The Council took the subject into consideration, and appointed a committee to consider and report what prizes they should offer for the encouragement of Art workmanship as applied to manufactures; and on the recommendation of that committee the Council decided on offering prizes for the successful rendering of designs in the several branches of industry indicated in the Table headed 1863.

One principle, namely, that of rewarding the actual workman for the work of his own hands, as was the case in the wood-carving competition, was adopted in the offer of these prizes, but instead of leaving the workman free to take any design he might think fit, it was thought well to place before him prescribed examples, of acknowledged merit, from which he was to work, it being considered advantageous that the workman should have his attention particularly directed to the works of artists of high reputation which might aid in educating his taste. Accordingly the Council in each case named the subject to be worked, and sold to the workmen at cost price, photographs, chromolithographs, casts in plaster, as well as rough casts in bronze, of the examples prescribed. The time allowed for the works being sent in was necessarily short, but, nevertheless, bearing this in mind, and looking at the difficulty of making known the competition among those interested, the result, as will be seen by reference to the Table (1863), was very encouraging. The judges for the wood-carving were appointed—three by the Council and three by the Wood-Carvers Association—the prizes in this department being offered jointly by the two bodies; and Messrs R. Redgrave, R.A., Mr. Digby Wyatt, and Mr. John Webb undertook the duty on the part of the Council. These gentlemen all acted as judges in the general competition of the same year, and also in that of the following year (1864). In the last year (1865), owing to the unfortunate illness of Mr. John Webb, he was unable to act, and Mr. Alfred Morrison, at the request of the Council, gave his services as one of the judges in the place of Mr. Webb. To these gentlemen the Society are greatly indebted, and their names are a sufficient guarantee to all for the justice and impartiality of the awards.

In the following year the Council determined to renew the competition, and issued a list, very much extended, including the wood carving competition, and offering prizes to a very much greater amount (see the Table headed 1864). The time for execution was considerably enlarged, and the result is shown in the Table. The response has not been adequate to the enlarged list and the increased amount of prizes, but the judges declared that the work was, on the whole, of a decidedly higher character. In the January of 1865, previous to renewing the offer of prizes for another year, the Council invited the competitors and their friends, as well as a large number of delegates, to meet and discuss the subject, with a view of ascertaining, if possible, the causes which had led to so small a response to the programme. At this meeting the reasons put forth were—

1st. That the competition had not been sufficiently made known in the quarters interested in the subject.

2nd. That sufficient time had not been given for the execution of the work.

3rd. That sufficient care had not been taken in the selection of the articles required to be worked, which ought, as far as possible, to be of such a character that when executed they should be saleable.

4th. That employment among the artizans had been so good that very few had been able to find time to take advantage of the competition.

As far as the first three reasons were concerned, it was pointed out that advertisements in the papers had been inserted, calling attention to the prizes offered, and a distribution of programmes had been made in a considerable number of workshops; that a very much longer time had been given than in the first competition; that in the selection of objects for working, the Committee had kept in view the importance of selecting such works as, when executed, should have a commercial character.

With regard to the fourth reason given, the Council could not feel otherwise than gratified at such a condition of business. The Council, in issuing their next programme, took into their consideration the first three objections which had been raised. In going over the programme it was thought desirable to extend it, and in every case where it was possible examples were selected with a view to the works, when executed, being of a saleable character, and a longer time was given for the execution. The particulars of this competition are given in the Table headed 1865.

Increased means of publicity was taken, by advertisements in the newspapers, not only of the metropolis and in such of them as are known to have a circulation among working men, but also in the newspapers of Birmingham, Sheffield, the Potteries, and other centres of industry. The programmes were distributed widely in quarters where it was thought likely they would attract attention; and a large number were placed in the hands of the Wood Carvers Association, for distribution among their members.

An appeal was made by the Council to the various City Companies for help in the way of prizes; but two only answered the appeal—the Worshipful Company of Salters and the Worshipful Company of Plasterers—the first giving an annual donation to the general prize fund of £10, and the latter giving two special prizes, to the amount of £15, in that branch of trade with which they are connected, to be competed for by artizan apprentices and students

The time given for the execution of the works amounted to very nearly twelve months, and the result, as appears by the Table (1865), does not show an adequate response. The question arises what are the causes which have led to this state of things, and can any steps be taken by which a larger number of competitors can be secured?

* This will be found at the end of the Table; it is there placed for convenience of comparison with the subsequent years, though in fact this competition preceded in time, and was separate from, the general competition, the particulars of which are found in the first portion of the Table.

1863.	Works sent in.	Prizes awarded.
1ST DIVISION.		
WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.		
CLASS 1.—MODELLING IN TERRA COTTA, PLASTER, OR WAX.		
(a) The Human Figure in bas-relief	23	1st and 2nd
(b) Ornament in bas-relief	8	1st and 2nd
CLASS 2.—REPOUSSE WORK IN ANY METAL.		
(a) The Human Figure as a bas-relief	3	2nd
(b) Ornament	1	1st and 2nd
CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.		
Ornament	2	Two 2nd prizes
CLASS 4.—CARVING IN IVORY.		
The Human Figure in bas-relief	4	1st and 2nd
CLASS 5.—CHASING IN METAL.		
(a) The Human Figure	6	1st and 2nd
(b) Ornament	11	Two 1st and two 2nd
CLASS 6.—ENAMEL PAINTING ON METAL, COPPER, OR GOLD.		
(a) The Human Figure	none	..
(b) Ornament in grisaille	1	Not in accordance with conditions.
CLASS 7.—PAINTING ON PORCELAIN.		
(a) The Human Figure	5	1st and 2nd
(b) Ornament	3	2nd
CLASS 8.—INLAYS IN WOOD (MARQUETRY, OR BUHL), IVORY OR METAL.		
(b) Ornament	2	Two 2nd
CLASS 9.—ENGRAVING ON GLASS.		
(b) Ornament	none	..
CLASS 10.—EMBROIDERY.		
Ornament	1	None
2ND DIVISION.		
WORKS TO BE EXECUTED WITHOUT PRESCRIBED DESIGNS.		
(a) Human figure in alto or bas-relief	76	2nd and 3rd
(b) Animal or still life		1st, 2nd, and 3rd
(c) Natural foliage, fruit, or flowers, or conventional ornament		1st, 2nd, 3rd, and two extra.

Prizes to the amount of £162 were offered.
Seventy works were sent in,
Amount awarded, £109.

1864.	Works sent in.	Prizes awarded.
1ST DIVISION.		
WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.		
CLASS 1.—CARVING IN MARBLE, STONE, OR WOOD.		
(a) The Human Figure	5	1st and 2nd
(b) Ornament	1	2nd
(c) Ornament	3	1st and 2nd
(d) Carving in wood—A design by Holbein	1	2nd
(e) Wood carving.—Head of a harp	1	2nd
(f) Ornament		
CLASS 2.—REPOUSSE WORK IN ANY METAL.		
(a) The human figure as a bas-relief	4	2nd
(b) Ornament	3	1st and 2nd
CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.		
Ornament	3	1st and 2nd, and one extra
CLASS 4.—CARVING IN IVORY.		
(a) Human figure in the round	2	Two 2nd
(b) Ornament		
CLASS 5.—CHASING IN BRONZE.		
(a) The human figure	1	1st
(b) Ornament	9	1st and 2nd
CLASS 6.—ETCHING AND ENGRAVING ON METAL.—NIELLO WORK.		
Ornament	2	1st

1864.—(*Continued.*)	Works sent in.	Prizes awarded.
CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.		
(a.) The human figure..	none	
(b.) Ornament	none	
CLASS 8.—PAINTING ON PORCELAIN.		
(a.) The human figure..	7	None
(b.) Ornament	2	1st
CLASS 9.—DECORATIVE PAINTING.		
(a.) Ornament	2	2nd
(b.) Ornament		
CLASS 10.—INLAYS IN WOOD (MARQUETRY, OR BUHL), IVORY OR METAL.		
Ornament	1	1st
CLASS 11.—CAMEO CUTTING.		
(a.) Human head	2	2nd
(b.) Animal	1	None
CLASS 12.—ENGRAVING ON GLASS.		
Ornament	none	
CLASS 13.—WALL MOSAICS.		
Human head	4*	1st and 2nd 1st †
CLASS 14.—GEM ENGRAVING.		
(a.) Human head	3	None
(b.) Full-length figure..	1	2nd
CLASS 15.—DIE SINKING.		
Human head	5	2nd
CLASS 16.—GLASS BLOWING		
Ornament	none	
CLASS 17.—BOOKBINDING AND LEATHER WORK.		
(a.) Bookbinding	1	1st
(b.) Leatherwork	none	
CLASS 18.—EMBROIDERY.		
Ornament	none	
2ND DIVISION. WORKS TO BE EXECUTED WITHOUT PRESCRIBED DESIGNS.		
WOOD CARVING.		
(a.) Human figure in alto or bas-relief. Animals or natural foliage may be used as accessories	19	2nd and 3rd, and two extra
(b.) Animal or still life. Fruit, flowers, or natural foliage may be used as accessories..	5	2nd
(c.) Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes as representing commercial value	9	Two 3rd, and one extra

Prizes to the amount of £623 were offered.
Ninety-six works were sent in.
Amount awarded, £274.

* Three general competitors. One Female competitor. † Female competitor.

1865.	Works sent in	Prizes awarded.
FIRST DIVISION. WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.		
CLASS 1.—CARVING IN MARBLE, STONE, OR WOOD.		
(a.) The Human Figure	3	Two 2nd
(b.) Ornament	2	2nd and extra
(c.) Ornament	1	None
(d.) Carving in wood after a design by Holbein	none	
(e.) Carving in wood after the Head of a Harp	none	
(f.) Ornament	none	
(g.) Ornament carved and gilt	none	
CLASS 2.—REPOUSSE WORK IN ANY METAL.		
(a.) The Human Figure as a bas-relief	5	None
(b.) Ornament	1	1st, and 3rd added
CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.		
Ornament	3	1st and 2nd

1865.—(*Continued.*)	Works sent in.	Prizes awarded.
CLASS 4.—CARVING IN IVORY.		
(a.) Human Figure in the round	2	Neither 1st nor 2nd — a smaller one given.
(b.) Ornament	none	
CLASS 5.—CHASING IN BRONZE.		
(a.) The Human Figure	none	
(b.) Ornament	4	Two 2nd and one extra
CLASS 6.—ETCHING AND ENGRAVING ON METAL—NIELLO WORK.		
Ornament	1	2nd
CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.		
(a.) The Human Figure	2	2nd
(b.) Ornament	1	1st
CLASS 8.—PAINTING ON PORCELAIN.		
(a.) The Human Figure	3	None
(b.) Ornament	1	1st
CLASS 9.—DECORATIVE PAINTING.		
(a.) Ornament	3	Two 2nd
(b.) Ornament	none	
CLASS 10.—INLAYS IN WOOD (MARQUETRY, OR BUHL), IVORY OR METAL.		
Ornament	1 metal	1st
CLASS 11.—CAMEO CUTTING.		
(a.) Human Head	1	None
(b.) Animal	1	None
CLASS 12.—ENGRAVING ON GLASS.		
Ornament	none	
CLASS 13.—WALL MOSAICS.		
Human Head	1	None
CLASS 14.—GEM ENGRAVING.		
(a.) Human Head	none	
(b.) Full-length figure..	none	
CLASS 15.—DIE SINKING.		
Human Head	3	2nd
CLASS 16.—GLASS BLOWING.		
Ornament	none	
CLASS 17.—BOOKBINDING AND LEATHER WORK.		
(a.) Bookbinding	3	1st
(b.) Leatherwork	none	
CLASS 18.—EMBROIDERY.		
Ornament	none	
CLASS 19.—ILLUMINATIONS.		
Ornament	3	2nd
SECOND DIVISION.		
WORKS TO BE EXECUTED WITHOUT PRESCRIBED DESIGNS.		
CLASS 20.—MODELLING.		
The Worshipful Company of Plasterers, London, offer the following:—		
Ornament.—Two prizes for bracket or truss in the Italian Renaissance style	2	1st and 2nd
Artisans' apprentices and students to compete for these prizes, but not master tradesmen, masters in schools of art, or those training for masters in the central school of the Department of Science and Art.		
CLASS 21.—WOOD CARVING.		
(a.) Human figure in the round, in alto or in bas-relief. Animals or natural foliage may be used as accessories ..	7	3rd and three extra
(b.) Animal or still life. Fruit, flowers, or natural foliage may be used as accessories	1	3rd
(c.) Natural foliage, fruit, or flowers, or conventional ornament, in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character, for ordinary decorative purposes, as representing commercial value	7	1st and no 2nd or 3rd, but two extra

Amount of Prizes offered £666.
Sixty-one works sent in competition.
Amount awarded £174.

DISCUSSION.

Mr. HENRY COLE, C.B., said that the opinions he might express must be considered those of an individual, and not as representing the views of the Council of which he was a member. He thought the statistics given in the report they had just heard might lead to wrong conclusions. It was, no doubt, quite true that the number of competitors on the last occasion had decreased; it was also true that the number of prizes offered was much larger; but neither of those facts, to his mind, warranted altogether the somewhat dolorous tone which he thought pervaded the report. In the concluding paragraph a question was asked, what had led to "this state of things?" and "can any steps be taken by which a larger number of competitors can be secured?" He did not sympathise in the term "this state of things" as implying anything like failure, and he would address himself at once to the question, as to how a larger number of competitors could be obtained? He would, in the first instance, dispose of the conclusions which seemed fairly deducible from the last competition. Art workmen were not like mulberries, to be produced at will in great numbers. It was not merely by increasing the amount of prizes that a larger number of competitors could be obtained. In the first place they must recollect that the competitors were artizans, who had to produce these works in addition to their daily occupation. Now it was not very amusing, when one had been engaged upon work, however interesting, all day, to take up the same thing again in the evening. He therefore thought, though he thoroughly sympathised with the movement, that it was asking a great deal from a workman to invite him to do work under such circumstances, and if he responded to the invitation, it was a good sign. His own opinion was—and it was strengthened by the decision of the judges—that the quality of the work exhibited on this occasion was much higher than it had ever been before. That was a sufficiently satisfactory result in itself, even though the number of competitors was much less; especially as the cause of this, which was alluded to at the last discussion, viz., that trade was very brisk and the workmen were getting full employment, no doubt still happily existed. He believed that trade on the whole was very brisk at the present time, but he wished to draw attention to the fact that the number of competitors in 1863 was 70, and of these 31 obtained prizes, which was 44 per cent. of the whole; in 1864 the number of competitors increased to 96, and the number of prizes given was 27, being at the rate of only 38 per cent., so that the quality of the work would appear to have deteriorated; but in 1865, when the number of competitors went down to 61, he found that the number of prizes was 31, being 50 per cent as against 38 per cent. in the preceding year. That was conclusive evidence to his mind that the scheme was working healthily. The following tables would illustrate his views:—

Years.	Total No. of Prizes.	Total No. of Subjects not awarded.	Total No. of Subjects not competed for.	Total No. of Subjects.
1863	31	2	2	18
1864	37	3	8	35
1865	31	6	13	38

Years.	Total No. of Competitors.	Total No. of Prizes.	
1863	70	31	44·285 per cent.
1864	96	37	38·541 per cent.
1865	61	31	50·819 per cent.

Various causes might tend to limit the number of competitors, but if the judges awarded a larger number of prizes, and thus pronounced the work to be of higher quality, it was, to his mind, exceedingly satisfactory; therefore he came to the conclusion that they need not be discouraged by the results shown. He was accustomed in his work to observe how long it took to make the public even acquainted with what was going on. He was never astonished at any amount of public ignorance; he accepted the fact, and did his best to put it right as far as it was his business to do so. He had known instances of even educated persons not being aware of the very existence of the Art Training School, which had now been at work for thirty-five years. The Society of Arts might spend a large sum in advertising this scheme, but they must be patient in expecting results; they had been at work in this matter only three years, and he thought the signs were satisfactory. A point had been raised as to whether the workmen should not be allowed to execute their own designs, and whether that would not increase the number of competitors? His own opinion was that it would not, and also that it would tend to lower the character of the work. He thought the art workmen and the class of artizans generally were not much trained as artists and designers. Years ago they had such men as Holbein, who made designs for book-covers, and jewellery, built houses, and painted pictures, but they rarely found such a combination of qualities in one individual at the present time; and he believed if they asked artizans to give their designs *plus* the execution, they would get some fearful abortions. It was enough, he thought, to ask art workmen to study really fine examples, and imitate them. We had, in fact, very few designers in this country at best. There were strictly ornamental designers, and he was happy to say these were increasing; but at present, he believed, the designers in the manufacture of pottery who were distinguished in that art were very few, therefore he thought if they asked for designs *plus* the execution they would rather retrograde than otherwise. Reverting to the question how the number of competitors might be increased, it occurred to him that if the workmen were allowed by their employers to exhibit, in addition to the class of objects for which prizes were offered were some portion of the work they had in hand, showing the excellence of their ordinary workmanship, there would not be that draw upon their time which there was in the execution of the special objects which did not come within the scope of their daily occupation. He did not mean by that that the Council should give up calling attention to the works of Raffaelle and other models of excellence, but he thought such an addition as he had suggested might be advantageously made, and would tend to increase the number of competitors. He might be met by saying "manufacturers like to keep their good workmen to themselves, and not trumpet forth their excellencies." That might be true to a certain extent, but, happily, that state of mind was passing away. They found at the last exhibition both British and French manufacturers were very willing that the names of the workmen should be made known in connection with the articles they exhibited; and he believed that would be the case to a larger extent at the next Paris Exhibition. If, for instance, Messrs. Hunt and Roskell had Vechte for their chaser, and if Messrs. Hancock had Armstead, they would naturally take a pride in employing such men. The suggestions he would throw out, and to which he wished especially to draw the attention of the meeting were:—That artizans may exhibit specimens of workmanship executed by themselves in the several classes which have been produced for manufacturers—such works being accompanied by a statement of the exact share of the work which has been performed by the competitors; that portions of complete works should be admissible; that, in view of the Paris Exhibition, the Council should address manufacturers, requesting them to assist their workmen to show their skill for exhibition in Paris.

Mr. George Lock begged to offer the following suggestions, as to the best means of improving, extending, and encouraging the cultivation by art workmen of the practical skill required in the execution of the more artistic class of work now in demand for the decorative and useful arts:—1st. The appointment of a special committee to take evidence and report thereon, as the best means of eliciting the opinions and deliberate judgment of art workmen and all parties practically engaged in the arts, which would afford an opportunity of fully considering the highly important and valuable suggestions made by Mr. Beresford Hope, and adopted in the report of the Royal Academy, relative to the introduction into the Royal Academy of a class of Associates formed of art workmen, the full particulars of which appeared in the *Journal* for July 31, 1863. Many employers and workmen, from being unused to address a large assembly, have the greatest objection to offer any remarks on such a subject before an audience like this, from the difficulties they find in concentrating their thoughts or opinions sufficiently to express them in a few minutes under exciting, and to others depressing influences. The eminent success and valuable information obtained by the Committee of the Society of Arts on the state of Musical Education is an example of collecting most important suggestions and opinions from men who would never have given them before a large public assembly. The valuable and interesting evidence obtained by a Committee of the Houses of Parliament in 1841 on the fine arts and the decoration of the Houses of Parliament, in the answers to 70 questions put to Richard Mitchel, a wood-carver, is a case in point. In the event of further competitive exhibitions, I suggest a return to the original condition of adjudicators being selected in part from the practical workmen in each trade invited to compete; also that each trade be solicited or allowed to contribute to the prize fund; and that whenever any article is specially named for competition, it should always be of such proportions, character, and completeness as will make an ordinary saleable article of the best workmanship, thereby lessening the objections of mediocre workmen to employ their time in an attempt to produce an object worth exhibiting, that in so many competitions, if not awarded a prize, has proved a loss, from the unsaleable character or difficulty of applying the work produced to a commercial purpose. That at all such exhibitions the superior work of deceased men of all ages that can be obtained should be exhibited, the wide and important influence of the Society being used to induce private owners and employers to contribute such works and encourage them to offer special prizes for any subject they may select, subject to the approval of the Council,—this for the purpose of making the Exhibition more attractive as well as instructive to the general public and art workmen. That from the limited space in the Society's rooms, and the difficulty of organising a staff of officers and attendants to any extensive exhibition, without seriously interfering with the ordinary business of the Society, it is highly desirable that application for exhibition space and accommodation should be made to the authorities of South Kensington, or, in default, some more popularly known exhibition rooms should be obtained; so that workmen, besides having a chance of a prize, might have the more coveted reward of a sale for their work, and of being introduced to the public buyers; and there might also be an opportunity for employers and foremen getting a better test of the abilities of men to suit their separate departments than they now possess, and which the comparatively private exhibition of the works hitherto sent in competition has afforded. And, lest this proposal may be deemed too extravagant to be realised, I would remind you of the notice lately given in the Society's *Journal*, of the manufacturers and workmen of Paris in the bronze, iron, zinc, and silver trades, with friends of art as honorary members, having established a society to give a number of prizes annually, and who, in December last, held an exhibition of their works, and awarded 20 prizes, besides medals and honourable mention, for modelling, chasing, ornamentation, drawing, and founding in bronze and iron, turning, and mounting, the directors of the Conservatoire des Arts-et-Metiers having granted space for their exhibition. The society in addition appoints delegates who act as arbiters in disputed copyright in works of industrial art; they likewise grant pecuniary aid to their aged and infirm brethren. Such, I consider, affords a worthy example to be followed here. The art-workmen of Manchester, to the number of 200, have this week opened an exhibition of 400 examples of art manufacture in the hall of the Royal Institution. Edinburgh has had two exhibitions, five to seven years back, of a similar class, in the Royal Institution of that city. And the time is not far distant I trust when the art-workmen of London, not of one trade, but all, will hold their exhibitions in a hall of their own, devoted alone to the promotion of Art. Among other suggestions I would have the designers' aid enlisted, by offering prizes for the actual working drawings in full detail of any of the objects actually exhibited, or which may have been executed and fixed in places from which they cannot be brought for exhibition, but which may be thus inspected by the judges. Thus large and small architectural work, iron gates, garden decorations, &c., might be represented. The artistic guidance of such men is of vital import in the present depressed state of art taste and ability to design or draw among operatives. I consider this a most important principle to get acted upon, as more is to be gained under existing circumstances by looking at things as they now are, and helping them on in their present trade way, than by striking out a new path altogether. The works of art-workmen who are employers, or parties in business for themselves, should compete in a class of their own, forming a separate division from the journeymen, who hitherto have laboured at a vast disadvantage in their leisure hours, from being opposed by skilled workmen or employers, who had sufficient capital to devote months of labour in producing saleable articles, or that had been sold already from the retail shops, and who have carried off many of the principal prizes already awarded by this Society, but who, it should be said, have likewise been the largest and most important contributors, as Wallis, Kendall, Baylis, Perry, Robinson, Hewetson, Holmes, and others, a class of men who it is most desirable should be encouraged and supported to the utmost by this Society, as aiding in a great degree to ensure the first element of success—sufficient works being thus sent in to make up a popular exhibition worthy of the great exertions and outlay made. Their success and encouragement would act as a stimulant and impetus for other workmen to qualify themselves for business engagements beyond the monotonous toil of the workbench, more than if such a class were excluded from competition, as Mr. Hawes suggested in his reply to my remarks at the meeting or conference held in this room on December 21, 1864. That remark, which made a very deep impression on me, was somewhat qualified in the report given in the *Journal*, but it has doubtless had very much to do with the retirement of all the class of employers, whether art-workmen themselves or not, with but one exception, that exhibited here in the previous exhibitions from the present competition, as, coming from the Chairman of the Council, it led them clearly imagine they were not of the number this Society wished to encourage; and, from it not being sufficiently clear in the printed conditions or programme, that employers were to form a division alone, or were to be excluded from the competition, a great number of ordinary journeymen have refrained from executing any work, lest it should have unfairly to compete with the works of employers, but who, nevertheless, may yet be art workmen, thus accounting, in a great degree, for the paucity of specimens in the present competition. Again, in judging the

works of these two divisions or classes, I would suggest that the past and present standard of excellence, as adjudicated on by this Society, should be continued for the division of works exhibited by the employers, as well as Art workmen, who also may be employers or in business for themselves. But it is manifest to those practically acquainted with the present state of wood and stone carving, metal workers, decorators, ceramic workers, and other art branches, that the number of journeymen who can independently produce a finished high class work of art industry in their leisure hours is so very small, that, as in the case of the wood carvers, nearly all in the west London trade that can at all conveniently spare the time have already competed; yet how trivial and insignificant is the result; whilst the provincial workmen, as a body, yet remain in entire ignorance of the whole scheme of art workmanship competition, both here and at South Kensington, for want of explanation and greater publicity. Until design modelling and drawing are more generally admitted as a necessity, for a good skilled workman to possess, no numerous specimens of high class can be expected in such competitions; therefore I would for a few years award a much larger number of prizes, lowering the standard for journeymen, as an encouragement to employ more frequently their spare time in executing works for exhibition, as is done with the probationary or elementary classes in our schools of Art; for very strong prejudices and old habits have to be removed from among the class of well paid workmen to induce them to compete and exhibit under the most favourable circumstances. They should also have every aid possible afforded for the sale of their works, by the exhibition being held in some popular place, and made as varied and attractive to the public as possible. The exhibition should always take place between February and June, and eight or nine months' notice be given of the condition to be worked on; it should be opened as quickly as possible after the specimens are sent in, the awards being made within one month, or as soon after opening as can be. The public should be admitted two evenings in each week it remains open, free, or at a very small charge. The distribution of prizes should take place a few days before closing, and be in public. Such acts would serve as an impetus to all concerned to examine and scrutinize still closer. Thus the art workmen and employers would be more willing to part with important works recently executed, or old work as examples from their stock for a period of two or at most three months, in lieu of the many months the competitors and exhibitors had their works retained in this house without the general public seeing them, or the prizes being distributed; and which I know has operated, with several large exhibitors, in a way most injurious to the progress or success of this and future exhibitions by their non-appearance. As many of these suggestions have been urged by me most strongly on several former occasions in this room, and through the medium of the press, and have likewise been made by others of much greater experience in art education, Messrs. Digby Wyatt, Cole, Beresford Hope, Godwin, and many more, I do trust therefore that with the support of the Council no obstacle, either in or out-doors, will be allowed to obstruct the progress of this great movement, made with the vast influence and resources of this great Society. We ought to look on the present state of the art workman's education generally, as well as that displayed in the few clever works sent in, creditable and meritorious as most of them are to their producers, as but the knowledge and skill of mere children in art compared with what man has produced in former years, and may yet fairly seek to excel with the advantages now to hand. I must again urge, as a strong suggestion, a still more extensive publicity to the Society's schemes, by seeking the co-operation of all Institutions in Union, the Workmen's Club Institute, the secretaries of all the Working Men's Exhibitions, metropolitan and provincial, the City trade companies, the chairmen of Halls of Commerce, the masters of the Government Art Schools, likewise some of the ordinary trade societies, and by advertising extensively in those newspapers and periodicals that are known to circulate by hundreds of thousands among the entire working population of the country. All this and much more can be done legitimately to prove the earnestness of the Society to elevate the state of the workman's art skill, and doubtless would tend to enhance its already great fame, vast influence, and resources by attracting fresh members. In conclusion I beg to recall your attention to the generous encouragement afforded a century back by this Society to aid progress by the prizes awarded to Thomas Banks, for a design for furniture, two models and two works of sculpture exhibited between 1763 and 1769, to the amount of 105 guineas; and the like sum between 1759 and 1761 to Nollekens, the sculptor, for four works; to John Bacon, over £200, his first work being sent in in 1769, when 19 years of age, besides the gold medal for his statue of Mars, which, with its companion figure of Venus, he presented to the Society, with the accompanying letter, which cannot be too widely known:—"The honour you have done me in your acceptance of my statues of Mars and Venus affords me an opportunity, which I gladly embrace, of acknowledging the many obligations I owe to the Society. It was your approbation which stimulated and your encouragement which enabled me to pursue those studies which a disadvantageous situation had otherwise made difficult if not impossible. Believe me, gentlemen, I never think of the Society without gratitude and without the highest idea of the principles on which it is formed, and which justly place it among the institutions that do honour to human nature, raise the glory of a nation, and promote the general good of mankind." This was the work and the reward this Society obtained for its labours a hundred years since. Should it rest or be satisfied with less now? I say, a hundred times, No!

Mr. Harry Chester confessed he shared the feeling expressed by Mr. Cole as to the dolorous tone of their secretary's report on this subject, and he was glad to find they did not after all regard this movement as a failure and were not discouraged in it, but that the object of the present meeting was to endeavour to carry out with greater success than hitherto the work which they had had in hand for these three years past. He had listened with interest to the remarks of the last speaker, and he thought he and Mr. Cole together had hit upon the real causes why this movement had not succeeded better. Far from being discouraged at the amount of success, he felt rather surprised that in so short a time so much had been done. This Society should certainly not despise "the day of small things," for they all knew that the great exhibitions of 1851 and 1862 had originated from very small beginnings. The question was, whether or not they had made a good beginning, and whether the encouragement of these competitions was likely to be useful to art workmen? If so, they should not be discouraged by trifles, but get the best information they could for improving their course, and pursue that course with energy and determination. He approved of the suggestion of Mr. Lock, that a committee should be appointed to ventilate this subject more fully. He thought one reason why they had not succeeded better was that they did not sufficiently understand the mind of the art-workman, and he did not sufficiently understand the mind of the Council. Another point on which the secretary had expressed himself somewhat unhappy was, the small response that had been made by the great City companies. He (Mr. Chester) would say he was surprised they had made any response at all. He considered that the application to those public bodies had not been made in a way calculated to lead to any great amount of response, a circular only having been addressed to them, asking them whether they would subscribe to an art prize fund. He thought the subject had

not been approached with sufficient gravity, and that a more forcible appeal should have been made. There were two companies which especially deserved notice in connection with this matter, viz., the Harness Makers' Company and the Painters' Stainers' Company,—the latter being the first to inaugurate exhibitions in connection with their own branch of industry, partly from their own funds and partly by a grant from this Society. Those exhibitions had been of a highly satisfactory character. He hoped the subject would be discussed in all its bearings, so as to see in what manner the object they had in view could be best carried out.

Mr. Peter Graham said there were two points on which he would offer a few observations. The first was with regard to the excluding of works which were the designs of the workmen themselves. He differed from his friend Mr. Cole on that point. He did not think it wise to exclude the designs of the workmen who executed the work, though works executed from prescribed designs should still be retained. He fully concurred in the suggestion that the large employers of art-workmen should allow completed works, or portions of works on which the men were engaged, to compete on these occasions. He believed that would tend largely to increase the number of competitors, and make the objects exhibited more interesting. Those, of course, would not be from prescribed designs. As a large employer of art-workmen himself, he should only be too happy to act upon that suggestion, and he believed a great many others would do the same. He agreed generally with what had been said by Mr. Cole, and also very much with what Mr. Lock had stated.

Mr. Henry Maudslay would not have risen on the subject of art exhibitions, knowing very little about them, but as a tabulated statement had been prepared by the secretary, he would himself read one deduced from it, which he thought would illustrate the subject still further:—

Years.	Exhibitors.	Amount of money offered.	Proportion of money to competitors.	Prizes awarded.	
1863	70	£162	2	£109	£165 more
1864	96	623	7	274	
1865	61	666	11	174	£100 less

It would be seen that in the year 1863 there were 70 exhibitors, and the amount of money offered was £162, the amount of prizes awarded being £109. The proportion of money offered to competitors was about two pounds to one, as shown in this table. In 1864 there were 96 exhibitors, the money offered was £623, and £274 was given away in prizes, the proportion between money and competitors being seven to one. In 1864 there was £165 more given in prizes than in the preceding year, proving that the proportion of competitors to the amount of prizes awarded was considerably smaller. In 1865 there were 61 exhibitors, the amount offered being £666, and the proportion between this and the number of competitors being 11 to 1. There was £174 given in prizes, but though the proportion of prizes was so large, there was £100 less given to the competitors. Taking that as the result, he thought the views taken in the report of the Secretary were borne out by the facts, and that the progress of this art workmanship competition had not been such as they might have expected. With regard to the efforts made by the city companies for the encouragement of art, he thought the exhibition held by the Ironmongers' Company was deserving of mention as one of the most magnificent that had ever taken place in the metropolis.

Mr. Figgins, jun., remarked that there were three great interests to be regarded in connection with these exhibitions:—First, the advantages resulting from them to the art workman himself, as a means of introduction to constant and remunerative employmet. The next interest to be considered, was that of the employer of labour, who was aware of the advantages of having an intelligent and educated class of men to deal with rather than ignorant men. The third interest was that of the public at large, for by creating these competitions, and improving the taste of the workmen, they best fitted them for maintaining the proud position which this country held in regard to manufactures in all the markets of the world. He thought the interests of the art workman had been put in too prominent a position. This was shown in the first Industrial Exhibition that was about to take place in the City of London. In the first place they invited competition in works of art, for which prizes were to be given, and then they invited the employers of labour to permit the men to use their time, money and tools, and the resources of their establishments to produce something for the benefit of the art workman himself. Such a thing was, in his opinion opposed to all commercial morality, and must tend to set people against these exhibitions. Te make these competitions successful they needed the united support of all classes, and in order to obtain that, the interests of all classes must be considered.

Mr. Ashe addressed the meeting at some length in favour of practical men in the usual branches of manufacture being associated with the judges in the adjudication of the prizes, without which he argued there was no security that the rewards would be bestowed upon the most meritorious workmanship, as no one but an actual workman could detect blemishes which were often intentionally concealed by putting false surfaces on to the work. He expressed his desire for the appointment of a committee, including practical men, to carry out the modifications in these competitions which the progress of events called for.

Mr. Mackenzie (of Sheffield), without going into the many points touched upon, would confine himself to one only. When he saw it reported that a smaller number of works had been sent in this year it struck him as a singular circumstance, inasmuch as this annual competition had become better known in the provinces by means of advertisements in the different local papers. He had done his best to stimulate the artizans of his own town in this direction, but he regretted that the results were anything but satisfactory. He had done so especially amongst his own class—the engravers—and the young men connected with him in trade, but there did not seem to be any great amount of ambition amongst them to forward themselves in their career in life. They simply looked to "Saturday night," and did not look further. On the whole he would say he felt very disheartened on this account, as he regarded these competitions as a great means of raising the art workmen of this country to the position which they ought to occupy. Speaking from his personal experience he could say that he had derived the greatest benefit from the study of the higher works of art with which the public depositories of the metropolis were so richly stored, and in the facility of access to those objects the art workmen of London possessed great advantages over those in the provinces, where those means of study did not exist, or only to a very limited extent. He had made it a point to spend a week or ten days in London every year for the purpose of improving himself in this respect, and he was sure the same plan would result in great benefit to all others of his class who adopted it.

Mr. R. W. Martin suggested the desirability of a certain amount of encouragement being given at these exhibitions to original designs in art workmanship, and thought some prizes might be specially appropriated to that purpose. He did not wish to see the workmen of this country always remain mere copyists; but he was desirous to see their abilities displayed as designers—a class of men which was very much wanted at the present day.

Mr. Macdonald thought it would conduce to the success of these competitions if the competitors were allowed

to a certain extent, to execute their own designs, and he concurred in the desirability of appropriating a portion of the prize fund to that object.

Mr. R. Redgrave, R.A., remarked that the works sent for competition might be divided into three classes, viz., those which were imitative reproductions; those which were reproductions with some degree of translation into another manner; and those which had a certain amount of originality of design. He believed he expressed the opinions of the gentlemen who acted with him as judges in saying that the first of these were generally well done, the second not so well done, and the third were on the whole ill done. In cases where the design originated with the exhibitors, a great want of taste was evinced; and the judges were really puzzled to know how to reward good workmanship which was combined with such bad design. With regard to the Schools of Design, they had now a considerable amount of experience. The competitions in those schools throughout the country for the prizes offered by the Government were unfettered by conditions, and prizes of from £10 to £25 had been offered to students, for designs to be sent to the central authorities for adjudication. That system was continued for several years, and was only abandoned in consequence of its not being responded to in a manner commensurate with the amount of the prizes offered. With that experience before them the Society of Arts was asked to encourage prizes for original designs, but, in his opinion, it was desirable that the art workman should first understand thoroughly what good workmanship was; but, if the Society was, after all, disposed to encourage design, it would be well, he thought, that this should form a class apart. If the response had not been very great when the design of the object was given, he thought it would be less if exhibitors were asked to work out their own designs. As to the advisability of asking manufacturers to permit their workmen to send works executed for them, either as completed works or portions, he thought this would be a good thing, but the difficulty would be in sparing the work for the length of time that was necessary. There were some difficulties in what were called translated designs, as, for instance, from a photograph into colours; and the mode in which the colouring was applied often showed that the workman had not taken much pains to examine the original of the work he was about to reproduce. This remark applied especially to the works of ceramic art sent in to their competitions, the colouring of which rather resembled gaudy china painting than the softened tints of the original of Raffaelle. In the *repoussé* work in the model of the same painter's "Three Graces," there appeared to be difficulty in translating from the flat surface into relief in metal, and on each occasion the judges had been unable to award a first prize in that class. There were some points on which the services of the workmen in aiding in the award of the prizes would be valuable, such as in detecting any attempts to disguise bad workmanship. He thought, upon the whole, that the results had not been discouraging. He had noticed that the names of successful competitors of former years appeared again in the same branch of the competition, which he thought was hardly desirable, and works which had obtained prizes here were sent again and again to compete in the various industrial exhibitions. Moreover, art workmen should aim at something higher than the mere sale of their productions, and should show some disposition to acquire name and fame. The Government had consented to purchase some of these works, which would be placed side by side with the best works of all ages, at South Kensington, and this, he thought, the producer could not but regard as a high honour. He was quite sure the various suggestions that had been made that evening would receive the fullest consideration from the Council.

Mr. Lavanchy expressed a hope that the question of offering prizes for original designs would receive from the Council the consideration which he thought it deserved. In all the exhibitions he had visited, in thi and in foreign countries, the designs carried out by th artizan himself always attracted the greatest amount c attention. He hoped nothing would be done to restri the facility of original design, but that provision woul be made, as far as possible for its development in the competitions.

The Chairman said he might take upon himself t promise, on behalf of the Council, that the vario observations and suggestions which had been made th evening would receive the most careful consideratio There were, however, one or two points in which he s some difficulty in acceding to the wishes of some of th speakers. In the first place the panacea sought to b applied to difficulties of all sorts, whether in great publi companies or in the House of Commons, had been pr posed, namely, a reference to a committee. He ha himself acted on a vast number of committees, an he could say it was only a very small percentage o those committees that had produced any practical results. It was true that there was at the present time a committee of this Society sitting on the subject of musical education, which was presided over by the gentlema who first addressed them, with an energy and abilit which would no doubt end in valuable practical result He thought it was important to encourage the love o music among art workmen, for it tended to elevate an refine the mind, and withdraw those who cultivated i from depraved tastes and habits. He confessed that h did not see what such a committee as had been suggeste could do on the question now before them? Possibly few of the most intelligent working men might be ask to meet the judges on some occasions, and a committe of the Council on others, to talk over the best mode of mo effectually promoting the objects they had in view. Th suggestions made this evening had been first those of M Cole, that the manufacturers should allow their artisa to send in competition portions of the particular wor which they had in hand. No doubt a great man masters would consent to that, if they could be assure that the works would be returned to them within limited space of time. He hoped the time was comin when masters who produced work of a high class woul feel pride in attaching the names of their workme to those productions. Mr. Chester, in speaking of th great City companies, appeared to think the Council ha not approached them in a sufficiently pressing manner, in having merely issued a circular, which was no responded to. He thought, however, that the mode of address, which was in fact the usual one, wa of little importance. It was not creditable to th ninety great guilds of London, with incomes vary ing from £50,000 to £1,000 per annum, that onl two of them had responded to that appea With regard to the report which had been laid befo the meeting this evening, he confessed he did not thin it was written in the dolorous spirit which his frie Mr. Chester had spoken of, or that it was really discou aging. Let them look to the proceedings of the Socie in respect of education. They began with examini about 50 young men about ten years ago, while o the last occasion they had nearly 1,500. This, ho ever, had been a work of time, and in the present ca they had prejudices to overcome and sympathi to enlist; he believed in a few years gre progress would be made in these competitio The suggestions made this evening, as far as they a peared to be improvements, would no doubt be adopte and all that remained to ensure success was that th workmen themselves should help this movement forwa With regard to the question of offering prizes for desig it must be remembered that the designer was a person o different education, and in a different position to th workman. It was not the object of the Society t offer prizes to that class, as there were already man institutions open to them in which they could compet He did not think the time had yet arrived when the

could say to the workman, "Execute your own design," for it was very seldom that any great work could be produced by one hand alone. The encouragement of the designer and of the workman were two distinct objects, and he thought they would do right to confine themselves to encouragement of the workman, leaving the designer to the care of the Government schools. There appeared to be some misunderstanding as to what he had said on a previous occasion, in reply to one of their most able and intelligent co-operators in this work—Mr. Lock. It had been said that he (the chairman) discouraged works being sent in by the employers of labour as distinguished from the art-workmen. It was true he did say so. The object they had in view was to obtain and publish the name of the skilful workman — not the name of the employer of labour, who might not do proper justice to the man who produced the work. The object of the Society was to bring forward the workman—to make him feel his own importance, not to encourage the employer of labour. With regard to the point that the objects selected for competition should be of a character generally saleable, he would say that the end in view was rather the promotion of the advancement of art than the production of saleable articles. If both could be combined, well and good. With regard to the decisions of the judges, there was no doubt that the gentlemen to whom that duty had been assigned were all most eminent in their respective vocations. This had been the case on every occasion of these competitions, and, although this year they had unfortunately lost the services of Mr. Webb, through illness, they had replaced him by a gentleman who was an amateur of acknowledged taste and ability. He might mention, in conclusion, that at the next meeting a paper would be read by a gentleman who had taken an active part in organising the Anglo-French Exhibition, held last autumn, and who was now endeavouring to promote a union between English and French workmen. He (the Chairman) hoped the working men of this country would find the means of visiting the next Paris Exhibition in large numbers; and although the time for receiving applications for space was drawing to a close, he thought, after hearing the paper to which he alluded, it would be considered advisable to apply for a space, even though it should be a limited one, in that exhibition in which the skill of the English art-workman would be adequately represented in competition with that of his French rival. He was sure the Council would be glad to receive any written suggestions with which gentlemen connected with Industrial Exhibitions in the provinces, or others interested in this subject, might favour them.

On the walls were some specimens of modelling in Keen's cement, lent by Mr. Reginald Palgrave, with a view of calling attention to this material as valuable for the use of art-workmen, and the following letter has been received by the Secretary:—

DEAR SIR,—You kindly expressed a wish that I should put down, in a few words, my experiences of modelling in Keen's cement. I need not point out the advantages of modelling in a material as durable as stone. The mode of working it is very simple. Mixed up with just enough water to form a stiff paste, it accommodates itself to the touch of the modelling tool, very much as clay does. There are two inherent difficulties in using it—one, it is not so tractable as clay; the other, that if not kept supplied with sufficiency of moisture, the finer touches are apt not to set—the portions, I mean, of the cement which applied to a ground work of set material are too thin to retain moisture until the act of setting be completed. This may, however, be, I think, almost completely guarded against by soaking the slab of cement—the basis on which the bas-relief is moulded—well before commencing to work on it. This soaking will not injure the completed portions of the model, as water will not soften the cement if fully set. That was my mode of working. I cast a slab of the cement on a wax board or sheet of zinc; when set, after soaking it well in water, having wetted as slightly as possible a sufficiency of cement in a saucer, having laid on the slab as much cement as I could hope to perfect within the limits of my sitting, the cement by degrees, as the extreme moisture dried away and the firmness of approaching setting commenced (it takes six hours to set completely), became more and more workable, till at the close, by the usual process of adding on roundness to the surface, refining away the edges, as is practised in the clay, the cement will receive a considerable amount of finish. I must confess that, with the defective powers of an amateur, after the model was set I have been accustomed to touch it up with sharp tools, and rasps and files used by jewellers (and I fear dentists). As, however the touch on the soft yielding material is the true charm of modelling, in this I feel I lost sweetness to gain precision. Nor is the cement so ductile, so firm, nor yet so silky as clay; in these highest qualities it seems to me inferior. To show, however, what can be done with it with wooden and ivory modelling tools, I send a rough slab uncleaned up. The "Lastrea fern" and the "Hart's tongue" are wholly untouched by steel implements. I think I have fairly explained the deficiencies of cement as a modelling material. It is also slower to work than clay, from being too incoherent, when very wet, to receive impress, and from being too stiff when under work for some time. The middle stage, if there is just sufficient water to render it ductile, and just a sufficiency of dryness to make it workable, is not of long duration. Nor does it lend itself to sketch with as clay does. Amateurs are apt to start "night-mares." Either the "night-mare" of difficulty where there is none, or the more misleading phantom of advising the use of a material incapable of the highest effects in art. This is what I am afraid of. Still, in hands more capable than mine, possessing as the cement does very certain advantages, it might, perhaps, prove a really efficacious material. It is for this reason that I am much indebted to you for allowing me to trouble you with this explanation, and for your kindly expressing a wish to see the few studies that I have been able to make.—I am, &c., REGINALD PALGRAVE.

Reigate, Surrey.

PARIS UNIVERSAL EXHIBITION OF 1867.

The Emperor, the Empress, and the Prince Imperial received on Sunday, the 25th February, the Commissioners of the Paris Exhibition.

The Emperor, in announcing the appointment of the Prince Imperial as Honorary President of the Commission, said:—"My son is at present too young to take an active part in your deliberations, but he will at least have an opportunity of learning in good time to honour labours which secure the prosperity and splendour of the State."

Obituary.

The unexpected death of Colonel the Hon. Sir CHARLES BEAUMONT PHIPPS, Keeper of her Majesty's Privy Purse, is certainly a loss to the Society of Arts. When the Great Exhibition of 1851 was being matured, he gave to the scheme most important aid, and took a warm interest in its organisation. Sir Charles expired shortly after five o'clock on Saturday morning, 24th February, at his residence in the Ambassador's Court, St. James's Palace, after an illness of only two days, from bronchitis. He was the second son of Henry, first Earl of Mulgrave, by Martha Sophia, daughter of Mr. Christopher Thompson Maling, of West Herrington, county Durham,

and was born 27th Dec., 1801, and married 25th June, 1835, Margaret Anne, second daughter of the Ven. Henry Bathurst, Archdeacon of Norwich, by whom he has a family of two sons and two daughters. Sir Charles was formerly in the Scots Fusilier Guards. He was secretary to his brother, the late Marquis of Normanby, when that nobleman was Governor of Jamaica, from 1832 to 1834. On the late Marquis of Normanby going to Ireland as Lord-Lieutenant, he was appointed steward of the vice-regal household, which he held up to 1839. After acting for a short time as secretary to the Master-General of the Ordnance, he was, in August, 1846, appointed an Equerry to the Queen. In December, 1846, he was made private secretary to his late Royal Highness the Prince Consort, and remained so till the death of Mr. Anson, who for a short period succeeded Sir Henry Wheatley, made Keeper of her Majesty's Privy Purse, and treasurer to the late Prince Consort. At Mr. Anson's death Sir C. Phipps took his office, and became also treasurer and cofferer to his Royal Highness the Prince of Wales in October, 1849. He was made Receiver-General of the Duchy of Cornwall in 1862, and in January of the following year was appointed one of the Council to the Prince of Wales. He was nominated a Knight Commander of the Civil Division of the Order of the Bath in recognition of his faithful services in her Majesty's household. Since the Prince Consort's death he has been one of the most intimate counsellors of her Majesty, especially in all those matters which were not affairs of State, and many persons have had reason to feel the influence of his kind services. His loss is a severe one to the Queen and the Royal family and to many of her subjects.

Publications Issued.

THE CATTLE PLAGUE; with official reports of the International Veterinary Congresses held in Hamburg, 1863, and in Vienna, 1865; now first published in English, by John Gamgee, Principal of the Albert Veterinary College, London, late Principal of the New Veterinary College, Edinburgh, &c., &c. (*Hardwicke.*) This work, which is illustrated with plates and woodcuts, is intended to supply the want of a complete history of the Russian cattle plague, which has been raging in Great Britain since the month of June, 1865. Part I. contains an introduction, besides an exposition of the causes, symptoms, nature, results of *post-mortem* examinations, of microscopic and chemical investigations, treatment, and means of preventing the cattle plague. The preventive measures adopted by Government, and the report of the royal commission appointed in 1865 to inquire into the history and character of the plague, are also appended. In this part are included original investigations as to the speedy recognition of the disease by a method of watching the temperature of animals, whereby an opportunity is afforded for the early isolation of affected ones. The results of investigations by Dr. Arthur Gamgee, as to the changes which take place in the blood and in the secretions of the body in the course of the disease, are also given. Under the head Prevention, special attention is paid to all suggestions hitherto made, and especially to a system of national insurance to protect stock-breeders and farmers against loss by death. Part II. is devoted to the history of the plague at home and abroad, also to the present history of the plague, passing in review the outbreaks in Great Britain, Holland, Belgium, and France, with complete details on the manifestation of the disease in the gardens of the Acclimatisation Society in the Bois de Boulogne, Paris. Part III. contains official reports of the two International Veterinary Congresses, held in Hamburg and in Vienna. The first was originated by the author of the present work, at a period when he was strongly impressed with the importance of attention being specially drawn to the possibility of the introduction of the cattle-plague into this country, as also to the general question of the spread of contagious diseases in animals between different countries.

A METEOROLOGICAL DIAGRAM FOR THE YEAR 1865. By C. O. F. Cator, M.A. (*Edward Stanford.*)—This is lithographed in colours, on one sheet, about 48 inches by 20, and shows at one view the daily variations of the barometer, thermometer, and wind; also the depths of rain daily; the weekly number of deaths in London; the weekly fluctuations in the imperial price of wheat; the changes of the moon; and various other particulars. A blank form of the same size is published, arranged for the entry of their own observations by observers in other parts of the country. This form is so arranged as to render it equally available to the meteorologist, statisticist, and medical man, who could readily trace by it the connection between atmospheric variations and the fluctuations of disease.

Correspondence.

SHOULD RAILWAYS BE THE PROPERTY OF THE PUBLIC?

SIR,—I regret that the discussion of this great question on the 7th February was all on one side; and I should have been glad, had time allowed, to have said a few words in support of the policy recommended by Mr. Galt and Mr. Chadwick. Perhaps you will allow me to do so in your *Journal*.

Twenty-two years ago Sir Robert Peel laboured to recuperate the country from the cardinal blunder of his railway policy, by directing the introduction of a measure to provide for the optional resumption by the state of the railways of the country. Mr. Gladstone took charge of the bill, carried it into an Act, and has appointed a commission, which is now sitting, to report upon the expediency of the principle. It is my belief that these statesmen have really had a purpose in what they have done; and all that Mr. Hawes can say will not convince me to the contrary.

"The roads of a country," observes the Select Committee of the House of Commons, "from the very nature of things, are public concerns; they are as necessary to the people as the air they breathe." All the highways of England are the Queen's—all the parish roads are the property of the public. Not one of them is the subject of private profit—the whole people are taxed to make and repair them. Each of them is under a trust for the public benefit: any traveller in the kingdom may indict their trustees if they are left in disrepair. It is the same with navigable rivers and the *littoral* of the realm. They belong to the state—every subject is free to use them—they are deepened, widened, embanked, lighted, buoyed at the public expense. The Trinity House, the river trusts, tax the shipping, native and foreign, for their support. They are the property of the whole nation—they are not the subject of private profit. What, then, means all this cant about the virtue of private enterprise, and the vice of Government interference in reference to that highway which has superseded both river and road? How many honest interests have railways utterly destroyed? How many road and river trusts have they made insolvent? For what did they come to parliament to ask for the delegation of imperial powers, to stand in the room and place of the state, to take men's land, to pull down their houses, to dispossess the poor, to change the current of trade, to make and mar towns, but solely on the preamble of advantage to the public service? These roads are the highways, even the byeways of civilisation. Why are they to be taken out of the category of other public property, appropriated by irresponsible private subjects, made mercantile adventures, conducted in shares for dividends? The question really answers itself. Every farthing taken from the public more than the bare cost of construction and maintenance, is a misappropriation of the public money—of a tax levied on, and paid by, the whole nation.

All the nonsense about centralisation and bureaucracy so freely used in this controversy, comes too late. The roads, bridges, and rivers of the country have belonged to the State, or its trustees, ever since the Romans began to make them. When the cost of construction and maintenance has been defrayed, they have been untolled. Where peculiar privileges have been given to individuals for public works, it has been solely on grounds of general advantage—profit to individuals being purely incidental. The *onus* lies entirely upon the "railway interest" to show why that species of highway should be taken out of the general category. It is not enough that Mr. Hawes should show the evils of Government interference. If that be an evil, it does not follow that railways, in place, like other roads, of being held in trust for the general good, should be the private property of shareholders—many of them aliens, none of them necessarily connected with the country through which they run—to levy usurious dividends for individual gain. At one time our customs and excise were farmed, letters were carried and delivered by private enterprise,—most of our taxes were levied by contract. All these functions have been redeemed by the state. Why should Government carry letters, any more than passengers or goods?

We are told, indeed, that Government does everything badly—that the stimulus of private interest is requisite to produce proficiency of management. But are railways private? Have they any of the elements of individual interest about them? What are any of the great railway companies but an *imperium in imperio?* how often, and how much, do the directors attend and do?—is their management a bit more personal than—is it even so personal as, that of our secretary of the navy in our arsenals? What are many of the directors of these vast national concerns but show-names, perhaps with influence in parliament, sitting at the board once a week, fortnight, or month. They are dealing with other people's money, and taxing the public as they please. What magic is there in a railway board table that it should qualify the very men to manage business well, which, when they direct the state concerns, they manage badly?

Is it in the least true that Government produces inferior administrative results to those of railway directors? If you can show me a single private establishment better conducted than our Customs and Excise, I will give up the whole case. Is there any work more complete than the business of our registrars and our census; of our emigration commissioners, of our factory inspection? The administration of the poor, left to local self-government, was the scandal of the country. By universal consent it was assumed by Government; and while indigence is infinitely better cared for, and the population has doubled, the business of relief is more cheaply and efficiently done, while pauperism has not only relatively but positively decreased. The constabulary is another Government department, of such unrivalled excellence that there was an universal clamour for depriving the corporation of the City of London of the management of their police, and handing it over to Sir Richard Mayne; and, in Ireland especially, that body discharges the most arduous and critical duties with singular aptitude. Fewer accidents per cent. happen to our Navy than to our mercantile marine; and if our army is expensive, from the absence of conscription, what troops in the world acquit themselves better? Strange as it may seem, I make bold to go still further, and to maintain that our Government "manages" a third of the surface of the globe, and a fourth of its population, in 45 dependencies, better and more cheaply than any board of directors or any other government. The working expenses of our railways at the last returns were £15,027,234; and of our whole Government, even in its present abnormal state, they were only £39,000,000, while on its normal scale—even under the Duke of Wellington's administration, and an unreformed House of Commons, they reached only £24,000,000. Where are we to look for a greater return of efficiency for so small an outlay? Above all, I advance the case of the Post-Office,—all-pervading—penetrating everywhere,—found in every hamlet, from Land's End to John-o'-Groat's,—aye, from the equator almost to the poles,—as proof of the vastest, the best managed, the most profitable, and the least burdensome institution that the world has produced. The virtue of the example is that the service is *ejusdem generis* with that of railways. It is a business of collection, conveyance, and delivery. It is universal, homogeneous, and uniform over the whole kingdom—the whole world. You see at once that the very sort of management in operation in the Post-Office is just that which would succeed in directing railway arrangements,—that they ought to go together,—that in one sense they do go together. What is Mr. Hawes' "wise saw" on this "modern instance?" It was not the Government, he says, that adopted the principle of our uniform penny postage, but Mr. Rowland Hill. It is not ministers who manage the department, but Mr. Rowland Hill. I might retort, it was not the miners and ship-owners who adopted steam, but Watt and Boulton; it was not the capitalists who took up the locomotive, but George Stephenson. The Post-Office was well managed before Mr. Hill had anything to do with it. His invention was a fiscal, not a mechanical or organic arrangement. It was not his, but Adam Smith's and Huskisson's—that simply of the profitableness of cheapness. Be it what it may, however, Mr. Hawes argues that its successful management by a government department was no evidence of ministerial efficiency, because ministers positively refused to adopt Mr. Hill's scheme until they were forced to do it. Need I say it is not the scheme in which consists the character of the management, any more than it is the principle of steam or of the locomotive in which consists the test of management by directors. In both cases it is the practical application of it that falls to the executive, and that in the case of the post-office is the work of the Government. But why did ministers refuse to adopt Mr. Hill's plans? The answer to that query is my reply to Mr. Hawes, and it really settles the whole cause of Government *versus* Directors. Ministers could not afford to lose the revenue to which the scheme required them to submit. They were assured the loss would be speedily made up. They did not believe that, and they were perfectly right. The expenses largely increased—the revenue regularly diminished—the correspondence of the country was promoted at a positive loss, in the place of a large previous profit—in short, the state directors were without a dividend, and their working expenses were doubled. Nobody but the nation at large could afford the experiment; there was a strict *concursus debiti et crediti*—the same persons who lost the revenue, gained the saving in the cost of postage, and the extension of internal communication. The process was self-adjusting—it was the same people taxed more in sugar that were less taxed in postage—what was taken away by one impost was restored by the saving in another. The community at large could lie out of their money and increase their outlay to attain an ultimate advantage which private persons or companies could not afford to wait for; and it is just because the Government could undertake an experiment, to which private enterprise is wholly unequal, that our letters are carried with lightning speed and unerring certainty and safety 700 miles for a penny, at a handsome and growing profit to the state. Government alone can afford the temporary loss of revenue which would result from a reduction of fares to prime cost; but if it will wait the result of the development of the effects of cheapness in the carriage of men and goods, as it has done in the case of letters, its reward will be the same. At once what it loses in fare and freight will be made up by the prodigious increase in trade, and consumption of taxable commodities; what the public pay in additional taxation to make up the loss it will save in

freight and fare; and ultimately the nett revenue will be greater than ever, while the prosperity arising from the consequent expansion of commerce will make the temporary sacrifice an eminently profitable operation. Only Government could have given penny postage—only Government can afford at once cheap and profitable transit.

Before proceeding to compare the probabilities of the efficiency of Government railway administration with that of actual railway management—for which I fear I must crave the indulgence of your space for another letter—I shall conclude this by an examination of some of the objections which are preferred to ministerial control.

We were told, with patriotic indignation, that Englishmen would never submit to the dictation to which foreign subjects bowed. "I am not," says Sairey Gamp, "a Rooshan nor a Prooshan." No—and that's the reason why the patriotism is all thrown away. In Russia, "all are equal before the stick," and we know how little freedom there is in Prussia. The truth is that in most foreign states the Sovereign rules—in England, the people. Government railway management in France means Persigny concessions, or De Morny lines; in England it imports that the people's representatives do the people's business, and that every mistake is challenged in the House of Commons. In fact government management means in England self-government; it means the transfer of administration from private directors, responsible to nobody, and whom the public never see and can't get at, to the servants of the state, daily accountable face to face in the House of Commons—to every one of the 658 representatives of the people. Not an accident could happen, not an overcharge be made, not an irregularity be committed, or an inconvenience prevail, without instant challenge, exposed in every newspaper throughout the kingdom. Where is the dictation? In directors that you cannot get at, or in secretaries of state who must answer for their work every day? Are directors responsible to their shareholders? To every appeal they flourish proxies in your face, and defy their own constituents. Besides, for what would the latter call them to account? For injury to the public?—Not at all; it is far more likely that they would cashier them for sacrificing a quarter per cent. temporary dividend, to the safety or convenience of the public.

But directors are fond of alarming us with anticipations of the corruption that would follow the cession of railway patronage to the state. *Quis tulerit Gracchos de seditione querentes?* Who have the patronage now?—Directors. What use do they make of it?—Sometimes to get themselves elected as members of Parliament by the votes of their own nominees. Who returns the members for Southampton?—Two steam-packet companies, under contract to the Government. Whom do the servants of these companies return?—The directors—amicably dividing the representation between them. I might instance the case of Harwich, and the curious history of the Galway Packet Company. Go wherever there is a railway depôt—a port that has an auxiliary packet service—a great centre of traffic—and find out the history of representation.

The very greatest danger that at this moment threatens the independence and patriotism of Parliament is, that it numbers among its members so many railway directors and large shareholders, who overawe the Government, who combine to defeat the public interest and accommodation,—who conspire to frustrate wholesome competition,—whose primary object in getting themselves elected is, not to serve the country, but themselves. It is said that electors have even made a bargain with railway potentates that they would return them, on a pledge that they would bring a line through their borough. Patronage — corruption! I do not know a plea more urgent for taking the whole business of railways out of the hands of railway boards than the scandalous jobbery their action on the legislature engenders; and it comes to this, either that directors and engineers must be disqualified from entering Parliament, or that the House of Commons will become a mere railway board, to which the great business of the nation will become a secondary consideration. I am not among the number of those who think the danger of the commonwealth lies in the strength of Government. On the contrary, I fear that Government daily grows too weak, and democracy too strong. Ministers, by insisting upon competitive examinations for place, voluntarily resign the advantages of patronage. But in point of fact there is no necessity for giving any patronage to Government in reference to railways. The public might save the whole burden of the pension list, by transferring the half-pay and pensioned servants of the state to the railway service. We might have a fine army on our lines of 120,000 men, without any of the cost. What better station masters could we have than officers in the army? What better engineers than our sappers, our artillery, and royal engineers? What better porters, guards, inspectors, superintendents, traffic managers than our soldiers, commissaries, transport service men? What better pointsmen, plate-layers, levellers, than our gunners, miners, and pioneers? What better employment for engineers, artillery, ordnance surveyors, in time of peace, than in making or repairing the public highways? I am pursuaded that the patronage of the railways, were it greater than it is, would not lead to greater corruption in the hands of Government than in those of directors; and that the presence of the latter in parliament, as representatives of so vast an interest, is infinitely more dangerous to the purity of the legislature, and to the public spirit and patriotism of the House of Commons, than the imaginary peril put forward by Mr. Hawes.

I listened with a glow of patriotism to the generous boast of self-congratulation, that private interests were not overborne in the questions of compensation in this country, as they were by foreign governments. For my part, I am satisfied that the enormous plunder extorted from the public by claimants against the companies, can only be controlled by energetic Government interference. When Mr. Hill complained that due allowance had not been made by Mr. Chadwick for the fact that the companies were forced to borrow at six, seven, and eight per cent., the fact he urged was just the case of the public against the directors. They borrow at usurious interest, which they tax their passengers to make up, when the latter, if borrowing the same from the Government, would get that at 3½ per cent. for which the bad credit of private persons has to pay such a much higher rate. Mr. Teulon brought out his old hobby about the extortionate local rates exacted from the companies. Here, again, he only confirms my plea. In the hands of Government the absence of beneficial occupation would cut off all liability to local imposts, and very justly, because, where a line merely runs through a parish, it adds nothing to chargeability, and where it plants a station it gives employment and saves rates by arresting pauperism. As Sir Robert Peel and Mr. Gladstone have both failed to perceive the financial difficulty suggested by Mr. Botley, I may be excused for being equally obtuse. It seems to me that the nominal change of railway shares into government debentures presents no embarrassment whatever. On the contrary, I am very confident that the greater confidence inspired by Government guarantee offers a very fair prospect, by the additional amount of securities thrown on the market, of effecting a reduction in the interest of the national debt. The statements of Mr. Allport I may safely leave to their own refutation. When he informs us that he is obliged "to charge such rates as would develope the resources of the district," he unconsciously betrays the cardinal vice of private management. Industry is no doubt sensible of the honour of his patronage

"encouraging the development of a particular manuture," and of his considerate favour for the "pig iron" de. Perhaps, however, our merchants and manuturers may be of opinion that common carriers ought be the servants of trade, not its masters—that it is lutely monstrous to think that railway traffic nagers have it in their power, by discretionary nipulation of their tariff, to make commerce ebb and w at their pleasure, and to alter its whole current as it ay suit their profit or convenience; and that the assumpon of these dangerous pretensions, which are derived tirely from powers of making arbitrary variations in e scale of charges, can only be effectually rebuked by overnment resuming functions it ought never to have dicated, and dealing equal justice to all its subjects by ling a uniform rate of carriage to a uniform rate of stage.—I am, &c., SIDNEY SMITH.

2, Bush-lane, Cannon-street, 16th Feb., 1866.

QUARANTINE AT CONSTANTINOPLE.—SIR,—I arrived here, with other passengers, from Alexandria, Smyrna, and other ports, on Monday morning, and after several ours' delay, we found ourselves placed in quarantine, n the ground that there were aboard ten packages of lted cowhides from Alexandria, put on board with a ecial patent of the health officers there. H.B.M. onsul-General interested himself in the case, but our peal failed. On the personal annoyance of this imsonment, I do not trouble you, but on general inciples. In this case we (the passengers) are subjected to quarantine in a case of epizooty; and have been posed to inconvenience in this inclement season, by ing removed from the cabins during their purification. We did not see the hides till they were put on board. It is t to be supposed that we have had the epizooty, or that e are going to visit the cows of Constantinople. Had e been first-class cows instead of first-class passengers, e propriety of the measure might have been more admissible. As in all such continental regulations, for this is not Turkish, but from an international commission, police considerations enter. Hence we are punished for an infraction of quarantine regulations. As we knew nothing of the cattle hides, and the steamer had received free pratique from our ports of embarkation, we are the victims, and the innocent are punished for the guilty; this is, however, perfectly *en règle*, according to continental notions. As this infringement did not affect the public health, the usual and the proper course in each violation of simple police regulations is to fine the ship r captain. It is necessary that such regulations, which o doubt prevail in other cities, should be examined d resisted in the interest of the public health, of rsonal comfort, and of general commerce. If provisions against epizooty are to be imported into general arantine, and public agents subjected to imprisonment, at suffering and injustice may be the result, more rticularly as it is the business of the executive and r native doctors and officials, casually employed for arantine, to make as much work as they can for mselves and dependents. It is necessary that quaran- regulations should not step beyond the limits of at is necessary for the public security, nor should penalties be imposed beyond the necessities of police ministration. These Constantinople regulations are result of an international commission of public health, in conformity with the like regulations elsewhere. e English representative has participated in this slation, and he is the representative in the Internal Cholera Congress. As these regulations affect only health but liberty, and likewise the trade of rous countries in which we have a large stake, it essary that our representatives should be men, reg not only technical physiological considerations, pable of appreciating and maintaining our political ommercial interests. These, in regard to cholera uarantine, have hitherto been altogether sacrificed e East. During the cholera epoch the internal trade of Anatolia was annihilated for three or four months, the public treasury exposed to great losses and embarrassments, and English commerce seriously injured. It is to be observed that in this case, although we made a distinct application, we were not heard by the council, but were condemned to imprisonment by the council without a hearing. These regulations are made by men regardless of human liberty and civil rights, and countenanced by individuals too careless to maintain what they esteem to be just. As the International Congress is on the point of meeting, now is the time to act.—I am, &c., HYDE CLARKE.

Egyptian S.S. Tuntali, in the Golden Horn,
Constantinople, Jan. 17, 1866.

WET BRICK WALLS.—SIR,—I live in a red brick house, on a high and exposed situation, and the violent storms of this winter have completely saturated the walls of my house, of course spoiling the paper of my rooms. Can any member of the Society inform me of any preparation to render brick walls impervious to wet?—I am, &c., LEOPOLD PAGET.

Park Homer, Wimborne Minster, Feb. 11, 1866.

MEETINGS FOR THE ENSUING WEEK.

MON......Entomological, 7.
Medical, 7. General meeting for election of officers and council. 8½, Clinical discussion, and a paper by Dr. Macpherson, "Case of threatened elephantiasis of scrotum in a European."
Asiatic, 3.
Society of Engineers, 7.
Odontological, 8.
Farmers' Club, 5½. Discussion "On the cattle plague, and the Government measures."
R. United Service Inst., 8½. Mr. C. W. Siemens, F.R.S., "The mode of testing electric cables."
Royal Inst., 2. General monthly meeting.

TUES....Civil Engineers, 8. Discussion upon "The hydraulic lift graving dock."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Professor Frankland, F.R.S., "On the non-metallic elements."
Geologists' Assoc., 8.

WED.....Society of Arts, 8. Mr. Coningsby, "On the late Anglo-French Exhibition, with a proposal for the formation of an Anglo-French Association."
Geological, 8. Mr. J. Beete Jukes, F.R.S., "On the carboniferous slate of the North of Devon and South of Ireland."
Pharmaceutical, 8.
R. Society of Literature, 4½.
Archæological Assoc., 8½.

THURS...Royal, 8½.
Antiquaries, 8½.
Royal Society Club, 6.
Royal Inst., 3. Professor Frankland, F.R.S., "On the non-metallic elements."
Medical. The anniversary meeting at St. James's Hall. Oration at 5. Dinner, 6.30.

FRI.... ..Astronomical, 8.
Royal Inst., 8. Sir John Lubbock, Bart., "On transformation of insects."
Royal Botanic, 3¾.

SAT ......Royal Inst., 3. Rev. G. Henslow, "On systematic and structural botany."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 15th February*, 1866.

2. Tithe Commutation—Return.
23. Private Bills—Rules.
26. Day of Humiliation—Correspondence.
Jamaica—Further Papers relative to the Disturbances (Part III)
Cattle Plague in Poland—Papers.
New Zealand—Further Papers.
Tobacco, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation.

Delivered on 16th February, 1866.

11. Bills—Church Rates Abolition.
13. „ Parliamentary Oaths Amendment.
East India (Indian Officers Commission)—Report of Commissioners.
Public Business—Forms, Rules, Orders, and Proceedings of the House of Commons.

Delivered on 17th February, 1866.

10. Bills—Public Offices (Site).
14. „ County Infirmaries (Ireland).
17. „ Jamaica Government.
20. „ Cattle Plague (as amended in Committee).
21. „ Habeas Corpus Suspension (Ireland).
12. National Gallery—Report of the Keeper.
15. Railway and Canal, &c., Bills—Board of Trade Report.
15 (1 to 35). Railway and Canal, &c., Bills—Board of Trade Reports.
17. Court of Chancery—Return.
Barley—Report of Experiments.

Delivered on 19th February, 1866.

9. Bills—Labouring Classes Dwellings.
22. „ Cattle Diseases (as amended in Committee, and on Re-commitment.
40. Navy Estimates.
41. Greenwich Hospital and School—Estimate.

Delivered on 20th February, 1866.

50. New Zealand War (1865-66)—Supplementary Estimate.
Education—Revised Code of Regulations.

Delivered on 21st February, 1866.

23. Bill—Telegraph Act Amendment.
54. Police (Counties and Boroughs)—Reports of Inspectors.

Delivered on 22nd February, 1866.

24. Bills—Cattle Plague (amended in Committee, and on Re-commitment.
25. „ Postmaster General.
29. „ Bank Notes (Ireland).
15 (36 to 50). Railway and Canal, &c., Bills—Board of Trade Reports.
27. Augmentation of Benefices—Return.
38. Bank of England—Account.
39. Queen Anne's Bounty—Account.
49. Civil Services—Supplementary Estimate.
42. Scientific Institutions and Instruction in Dublin—Minute.
48. Civil Services (1866-67)—Estimates (Class 1 to 7).

Delivered on 23rd February, 1866.

26. Bills—Fellows of Colleges Declarations.
27. „ Artizans' and Labourers' Dwellings.
28. „ Prosecution Expenses.
15 (51 to 56, and 125). Railway and Canal, &c., Bills—Board of Reports.
53. Army Estimates (1866-67).
57. General Committee of Elections—Mr. Speaker's Warrant.
61. Army (Colonies)—Statement.
62. Army (Effective Services)—Statement.
Public General Acts—Caps. I. and II.

Delivered on 24th February, 1866.

31. Bills—Elective Franchise.
32. „ Cattle Plague (amended in Committee, on Re-commitment, and on second Re-commitment).
15 (57 to 73). Railway and Canal, &c., Bills—Board of Trade Reports.
30. East India Loan—Return.
55. West India Islands, &c., Relief—Account.

Delivered on 26th February, 1866.

3. Bills—Exchequer and Audit Departments.
15. „ Tests Abolition (Oxford).
34. „ Cattle Plague (amended in Committee, on Re-commitment, on second Re-commitment, and on Consideration of Bill as amended).
37. „ Cattle Diseases (Ireland).
15 (74 to 84). Railway and Canal, &c., Bills—Board of Trade Reports.
29. East India (Revenues)—Return.
32. Naval Receipt and Expenditure (1864-65)—Account.
35. Bankruptcy Court—General Return.
36. Duchy of Lancaster—Account.
44. Navy (Dockyard Stock Valuation and on Expenditure on Ships, &c.)—Return.
Cattle Plague in Poland (1857-65)—Further Papers.

Delivered on 27th February, 1866.

15 (85 to 90). Railway and Canal, &c., Bills—Board of Trade Reports.
45. Navy (Education and Religious Denominations)—Statistical Return.
46. Navy (Health)—Statistical Abstract.
52. Colonial Governors—Return.
63. Committee of Selection—First Report.
65. Diseased Sheep and Lambs—Order in Council.
67. Cattle Plague (Ireland)—Report of Committee.
68. Trade and Navigation—Accounts (December 31st, 1865).
Fisheries (Ireland)—Report of the Special Commissioners.

Patents.

From Commissioners of Patents' Journal, February 23rd.

GRANTS OF PROVISIONAL PROTECTION.

Boots and shoes, finishing the soles and heels of—251—T. Marshall and H. C. Pretty.
Clay, moulding articles of—344—R. Jobson.
Dishes, &c., making—358—W. Boulton and J. Worthington.
Elastic fabrics—348—C. D. Abel.
Envelopes—340—E. Petito.
Envelopes—360—J. Allen.
Fancy needle-work on canvas, needles used in—378—B. Browne.
Fans, giving motion to—174—A. Bennett.
Fatty and oily bodies, treating—330—G. Gwynne.
Fire-arms, breech loading—366—J. Gunner.
Fish, catching—193—A. Bryson.
Fluids, filtering—356—T. Spencer.
Furnaces for melting metals—342—P. A. Muntz.
Galvanic batteries—338—A. Horwood and C. Brumblt.
Gas pipes—316—J. Macintosh and W. Boggett.
Ladies' skirts, springs for—334—J. H. Johnson.
Leather fabrics—272—J. H. Brown.
Liquids, decolorising or purifying—258—J. M. A. Montolar.
Liquids, measuring—372—W. Richards.
Metal bands, connecting the ends of—320—H. C. Lucy.
Motive power—359—V. Rastouin.
Paper—332—H. Larkin and R. Purkis.
Papers, embossing in colours on—296—J. Ingram and J. Gough.
Paraffin wax, purification and hardening of—322—W. B. Nation.
Photography, producing printing surfaces by—324—D. Winstanley.
Printing ink—367—S. Holmes.
Reaping and mowing machines—368—R. Sims, J. Beard, and R. Bun.
Railway and other carriages—369—U. Scott.
Railway carriages, axle-boxes for—362—E. A. H. Beuther.
Railway carriages, axles for—374—A. H. Brandon.
Railway carriages, construction and lighting of—364—R. Clark.
Railways, obtaining adhesion of the driving wheels of locomotive engines to the rails of—326—C. H. Holt.
Railway trains, electric intercommunication in—347—C. V. Walker.
Steam boilers, furnaces for—336—T. Molden.
Steam engines, regulating the supply of steam to—371—C. D. Abel.
Steam vessels—256—J. H. Johnson.
Ships' compasses, preventing oscillation in—353—W. Renney.
Time-keeper for watchmen—164—H., E., and L. Abenheim.
Valenciennes lace in twist lace machines, making—350—W. Spencer and T. B. Cutts.
Vessels, propelling—270—J. Howden.
Weaving, looms for—318—J. and J. Bulcock, jun.
Yarns or threads previous to dyeing, treatment of—314—J. Mallison.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Photography, producing printing surfaces by—469—M. Henry.

PATENTS SEALED.

2192. F. Haseldine.
2194. J. A. Wanklyn.
2209. S. T. Jones.
2213. W. P. Piggott.
2214. R. T. Holmes.
2216. A. Gurlt.
2217. R. Laming.
2220. W. H. Gummer.
2224. G. F. White and H. Chamberlain.
2226. W. Brookes.
2227. J. C. Green.
2229. W. Crookes.
2233. W. H. P. Gore.
2235. S. and S. Gilbert, jun.
2238. E. Cowpe and D. Hassell.
2239. M. Woodifield.
2244. H. C. Ash.
2264. J. M. Carter.
2257. W. Clark.
2264. W. Barford and T. Perkins.
2266. C. Reichen.
2267. H. Ellis.
2294. J. M. Hart.
2348. S. Fox.
2385. J. Fletcher.
2482. C. H. L. Wintzer.
2524. D. Grieg and R. Burton.
2948. J. de la Haye.

From Commissioners of Patents' Journal, February 27th.

PATENTS SEALED.

1971. T. D. Stetson.
2263. J. Elverson.
2269. J. Drabble.
2270. S. Kettle.
2272. J. Howard, W. Stafford, and W. P. McCallum.
2274. R. A. Brooman.
2278. J. Neat and F. Ford.
2280. T. B. Bailey.
2296. J. Dawson.
2297. W. Oldham.
2300. W. L. Wise.
2304. J. and W. Weems.
2355. J. Wakefield.
2359. E. T. Read.
2466. W. E. Newton.
2496. W. E. Newton.
2654. W. J. Armitage, F. Weeks, and J. Hodgson.
2771. T. Greenwood.
2872. G. A. Jasper.
2881. N. Beard and J. Malden.
2921. H. C. Davis.
3013. E. G. Lamson.
3065. G. K. Snow.
3334. G. and D. Hurn.
26. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

462. C. Billingsley.
479. W. Wood.
518. R. Maynard.
471. C. Malpas.
490. J. D. and A. P. Welch.
512. R. W. Thomson.
542. J. Yates.
494. J. Tatham.
516. H. Wilde.
547. R. J. Nodder.
564. W. Hadfield.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

412. J. L. Clark.
490. S. Ridge.
491. W. Ashton.
514. T. and R. Fielden, jun.
506. J. Dale.
412. J. L. Clark.

Journal of the Society of Arts.

FRIDAY, MARCH 9, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

MARCH 14.—"On Visible Speech, or a Universal and Self-interpreting Physiological Alphabet." By ALEXANDER MELVILLE BELL, Esq., F.R.S.S.A. On this evening Alexander J. Ellis, Esq., F.R.S., will preside.

MARCH 21.—"On Deer Forests and Highland Agriculture in relation to the Supply of Meat." By Professor LEONE LEVI.

CANTOR LECTURES.

A Course of Lectures by Dr. F. Crace Calvert, F.R.S., will commence in April. Particulars will be duly announced.

FINAL EXAMINATIONS.

The Rev. J. S. Brewer, M.A., Professor of Modern History and English Literature in King's College, London, has been appointed Examiner in English History.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The following letter has been addressed to the Secretary by Mr. Macfarren, who wishes it to be regarded as a supplement to his evidence given before the Committee:—

SIR,—An article in the *Athenæum*, of January 27, signed by Mr. Chorley, invites discussion of the point it proposes as an essential incident in any plan for a National Musical Academy; and I therefore, with every wish to do justice to the writer, offer the following remarks upon his views.

The proposal of Mr. Chorley is, that in such an institution there should be one text-book for each branch of study, and that the professors should bind themselves to teach according to its tenets. Mr. Chorley mistakes in supposing that this point has been overlooked by the witnesses before the Committee of Musical Education appointed by the Society of Arts, since, in the evidence I had the honour to submit to that body, I most emphatically urged the contrary opinion, namely, that each professor should teach according to his own system, but should have one or more sub-professors to prepare, under his direction, pupils for his class. In support of this let me adduce the obvious fact that no conscientious teacher can pledge himself to any uniform system or fixed theory, since his own experience in the practice of art and in tuition must constantly reveal to him new aspects of the subject to which his attention is directed, and it thus becomes his duty from time to time so to modify his course of instruction as to communicate in it his latest and best matured convictions.

A professor would be a mere machine who was restricted to the inculcation of any fixed doctrine, though even himself had been consulted in framing its limitations; and, in my belief, no one of such intelligence as should entitle him to a professorship in a National Academy would or could consent to become this mere machine.

It is one of the most obvious advantages of the Royal Academy of Music that the pupils of different professors, being in familiar intercourse with one another, discuss the various principles of their several teachers; for they have thus, in defending each the system of his own respective master, the best means of making clear to themselves their own perception of its tenets, and they have also the opportunity of comparing this system with others, and so enlarging their own views by a comprehension of the discrepancies and the identities between the divers systems taught in the institution. Let me distinctly state, however, that I think a student should never receive lessons at the same period from more than one professor of the same branch; a plan which, I am aware, prevails in some continental conservatoires, and which has the ill effect of tempting a pupil to compare the qualities of his several instructors, whereby he may frequently lose respect for both, and thus rarely can profit from either.

The science of music is manifestly as progressive as the art; it would, therefore, be as monstrous to establish in 1866 a code of tuition in any of its branches that should be enduring to future generations, as it would have been, any number of centuries since, to have legislated for the doctrines to be taught at present.

Lastly, the too just complaint, from time immemorial, against academical institutions—the complaint of the narrowness, prejudice, pharisaism, pedantry, and conventionality of the views they disseminate—may be averted by the admission of a plurality of methods; thus, and thus only, can that liberal spirit have free action which should characterise every foundation of the present age, and which is indispensable to the discovery of truth and its promulgation.

Trusting that these remarks may be received as proceeding from no spirit of opposition, far less from one of self-assertion,—I am, &c.,

G. A. MACFARREN.

7, Hamilton-terrace, N.W., Feb. 21st, 1866.

FOURTEENTH ORDINARY MEETING.

Wednesday, March 7th, 1866; William Hawes, Esq., F.G.S., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Baker, Rev. Charles, M.A., Tellisford, Somersetshire.
Hunt, John Hammond, 20, Cannon-street West, E.C.
Loy, William T., Dingwall-road, Croydon, S.
Whitelaw, John, Dunfermline.

The following candidates were balloted for, and duly elected members of the Society:—

Betjemann, G. W., 38, Pentonville-road, N.
Creed, H. Herries, Windham Club, St. James's-sq., S.W.
Curtis, John, 111, Westbourne-terrace, W.
Freutel, Henry, 124, Kingsland-road, N.
Hutton, T. Maxwell, Summerhill, Dublin.
Longdon, Frederick, Derby.
Northway, John, 27, Great Tower-street, E.C.
Woods, Miss Elizabeth, 27, Hyde-park-gardens, W.

The Paper read was—

ON THE LATE ANGLO-FRENCH EXHIBITION, WITH A PROPOSAL FOR THE FORMATION OF AN ANGLO-FRENCH ASSOCIATION.

By ROBERT CONINGSBY, Esq.

The Anglo-French Exhibition, held at the Crystal Palace last autumn, was a double experiment. It was intended to solve two questions; first, can a working-class exhibition be got together in which

amateur productions are, as a rule, excluded; secondly, are French artizans sufficiently friendly towards their English brethren to co-operate with them in a public work? To furnish a satisfactory reply to these two queries was the object my committee had before it from the commencement to the close of its labours. If, therefore, we have succeeded in this, I hope that in a great and rich community like ours, we shall not be too harshly judged when we confess that the experiment has cost £500 or £600.

With your permission, I will briefly relate the circumstances which led to the promotion of our exhibition. In the autumn of 1864 a party of friends, of whom I was one, paid a visit to the Working Class Exhibition at the Agricultural Hall, at Islington. Our object was to see the display and form an independent opinion upon the merits of the exhibition movement generally. The results of that visit I had the honour to lay before the public in the columns of the *Daily Telegraph*. We were dissatisfied with the prominence given to amateur and unfinished productions, and, in no spirit of narrow-minded exclusiveness, we suggested that before a work was publicly exhibited some standard of excellence should be attained to. We believed that the system of offering premiums to men to neglect the study of their own art and dabble in another, was more likely to prove mischievous than beneficial, and we said so. In reply to my letters, a gentleman on the North London Exhibition Committee ably expressed the opposite views, and threw down a challenge to me, to see if I could get up an exhibition on the skilled work theory. There is something very terrible to an Englishman about an unaccepted challenge. But for some time, feeling my own obscurity, I allowed the gauntlet to lie unheeded; but the words "see what you can do," so haunted me, that at length, with considerable diffidence, I ventured to pick it up.

I had the honour of acquaintance with men employed by some of the most eminent London firms. I asked if they would help me in the promotion of a skilled work exhibition? As I did not get a single refusal until a committee of fifty were got together, I think it was a sign that, at all events, among skilled workmen themselves, there was no disinclination to give my theory a trial. On the 2nd of March, 1865, we met and formed our committee, and at that meeting I proposed that we should extend our plan so that French workmen might, if they pleased, exhibit with us. The year 1865 being the jubilee of peace, we thought that the time was a favourable one for striking a blow at the jealousies and prejudices which have for so long kept the citizens of the two empires apart.

We decided that our exhibition should not only be a skilled work, but an Anglo-French, display. We issued our preliminary prospectus and asked for guarantors. Mr. Cave, M.P. for Shoreham, was our best friend in this matter, and to that gentleman the members of the Committee feel that they cannot sufficiently express their thanks, over three hundred pounds being guaranteed by Mr. Cave and his private friends. Further, when I wrote, at the close of the Exhibition, to express regret at the unfavourable monetary result of the experiment, Mr. Cave replied—in a letter full of kind and sympathising expressions—"I beg that you will think as little of my trouble and expense as I do.". As soon as we found our guarantee fund progressing favourably we took steps towards securing a site. After much discussion we fixed upon the Crystal Palace, and to that one decision we attribute our commercial failure. The distance from town, and the loss of the night incomes enjoyed by other exhibitions, were fatal, and counteracting advantages, upon which the committee had relied, were not forthcoming. After numerous interviews with the officials of the Crystal Palace Company, the sub-committee appointed for the purpose of securing a space, reported, on the 19th of April, that they had made the necessary preliminary arrangements, and the next subject taken into consideration was the deputation to wait upon the French workmen. The following minute was passed: "That a deputation, consisting of the five following members of the committee, be requested to proceed to Paris immediately, for the purpose of inviting French workmen to join their English friends in promoting the Anglo-French Exhibition;" the names were appended. I had the honour to be one of that deputation, and, as it may interest you to know how we were received, I will give a brief sketch of our proceedings. We obtained a few letters of introduction from influential gentlemen in London, and arrived in Paris on the 23rd of April. We had been previously told in London that the French working class would receive us coldly, that the alliance might be thought all very well among the educated portion of the people, but was not popular among the lower. Our experience, Sir, convinced us that this was an error. We not only found the upper classes friendly, but the workmen enthusiastic; and what seemed to astonish them most was, that English artizans, whom they had been in the habit of looking upon as cold and prejudiced beings, should have wished to be friendly with them at all. The two nations seem to long for an intimate and cordial friendship, but the "one is afraid and the other dares not" take the first step towards increased familiarity. Official and Governmental alliances are very well as far as they go, but a close and abiding friendship can only exist between people who know one another.

We commenced the delivery of our letters upon arrival, and for a week we passed to and fro from one arrondissement to another, calling upon editors, senators, deputies, prudhommes, and manufacturers, and receiving the utmost courtesy from all. Our plan was to deliver a letter of introduction, and when the gentleman to whom it was addressed expressed himself favourably towards our scheme, to ask him for two or three letters to any friends of his who were likely to be of service. This request being generally complied with, our work increased at the rate of the well-known horse-shoe problem. The more letters we delivered, the greater grew our task. Towards the end of the week we had interested enough people in our plans to make the formation of a French committee a practicable step. From introductions kindly given by M. Chevalier, whose name is almost as well-known in this country as it is in France, we made the acquaintance of some gentlemen connected with a very respectable association called the *Société du Credit au Travail*. By their agency a meeting of delegates from a number of trade societies, at which between seventy and eighty were present, was called at an office in the Rue Baillet, and we were invited formally to lay our scheme before them. We did so, and I am certain the other members of the deputation who are present here to-night will bear me out when I say that nothing could exceed the enthusiasm with which these representatives of some thousands of Parisian workmen received our invitation to fraternise with their English brothers. All, however, agreed that the notice was too short, and warned us that we must not expect a large quantity of articles from France; and we were implored not to make the mistake of supposing from that that the French workmen looked with coldness upon the undertaking. They agreed with us that the date was an auspicious one, and upon that account the experiment should at once be made, but must be well understood as being only the preliminary to some future demonstration which should more worthily testify to the great wish which animated all to be on terms of intimate friendship with those on this side of the channel. They asked many questions and made such pertinent remarks as proved them to be a highly intelligent and business-like body of men. Ten gentlemen were there elected to form a provisional committee, with power to add to their number. As we left the room we were completely embarrassed by the number of invitations we received to visit different gentlemen. As we considered our work in Paris

now over, we were resolved to return at once, so were compelled to refuse all but one, which was to take breakfast with the members of the provisional committee the next morning. Not to be thus put off, a number of delegates followed us out of the house—and I think I may use the expression literally—carried us by storm into the nearest elegant café, and, in spite of our most strenuous protests, insisted upon our taking some refreshment with them. During the hour thus spent we were entertained by their lively conversation, and could not help saying to each other, "What a pity it is that these jolly fellows and our friends at home don't meet oftener."

But now I must make the first and only complaint against the members of the French Committee. I said we accepted their invitation to a plain breakfast—just a snack, in short, before we started upon our return journey. Accordingly we went to the Rue Baillet punctually at twelve (which as most of you know is a very usual hour for the second breakfast in Paris), with appetites calculated to sustain the British prestige. We were taken to a grand café in the Palais Royal, introduced to a number of amiable gentlemen, and, without a moment's warning, compelled to sit down to a banquet of I should be afraid to say how many courses. And there were speeches and toasts, and toasts and speeches, until the heads of the deputation were almost turned by the great warmth of their reception. As soon as the time for our departure had come, our hereditary enemies drove us to the hotel, and with much hand-shaking and many hearty expressions of goodwill, wished us a pleasant journey home. The following extract from our minutes of May the 3rd refers to this act of perfidy. "In conclusion, the secretary stated that the deputation had everywhere met with the kindest treatment and most ready offers of assistance. Before leaving Paris the members of the deputation had been entertained by the new committee; when, somewhat to their embarrassment, what was called in the invitation a plain breakfast, proved to be a most sumptuous banquet served at a café in the Palais Royal. Speeches were made and complimentary toasts drunk in a most enthusiastic manner." I am not, I hope, a spiteful man, but I should like some day to have revenge, and give those French gentlemen a "Roland for their Oliver."

On May the 24th the Council of this Society were good enough to hold a meeting of art workmen in this room, over which you, Mr. Chairman, most ably presided, when two resolutions were unanimously carried; the first, "that this meeting having heard the statement of Mr. Coningsby in reference to the proposed Anglo-French Exhibition, recognises in this movement an evidence of the gradual extinction of national prejudices, and of the great advance which has been made by the workmen of both countries in the knowledge and appreciation of the true principles on which the material prosperity and moral progress of nations depend." The second was one pledging the meeting to do all in its power to assist the committee.

We next proceeded to advertise for exhibitors, the members of the committee having previously canvassed among their friends. For some time the applications for space came in very slowly, for intending exhibitors, like intending testators, put off signing their papers until the last moment. At length, however, by dint of great exertion and giving our movement increased publicity, we were set at rest upon this point. But, inasmuch as life is one succession of compromises, we were compelled to so far depart from our desires as to admit specimens of skilled workmanship from firms, with the understanding that the names of the actual producers should be appended to each article shown. I must admit that this was only partially done, but the fault cannot be laid at our door; in every case where it was not, it was a breach of faith on the exhibitor's part, every one having signed a promise to the effect just named. Upon the 25th of May it was thought desirable to have a member of the committee resident for a few weeks in Paris. So many letters and telegrams were constantly passing between Monsieur Potonié and myself, that the committee thought it would save time and trouble to have somebody who could reply on the spot to all queries and keep the French Committee constantly informed of our progress. Mr. Whiteing, accordingly, left for Paris. The step, I think, was a wise one, for matters went more smoothly afterwards. So far, with hardly an exception, our committee had been wonderfully unanimous, resolutions passing with great briskness; and, pressed as we were for time, it is, I think, to be regretted that some of us all at once became aware of a latent aptitude for debate. We began to move "amendments," and gradually there were two parties in our little chamber. Your humble servant and some others were occasionally in favour of despotism and strong measures; but, fortunately or unfortunately, as the case may be, a constitutional party—sternly re-resolved to trample down tyrants—arose, and long battles, with all the tactics of adjournments and "whipping-in," were fought over the bodies of departed minutes. I only mention these internal matters to obtain the character of impartiality as an historian. I may say, in passing, that the government were never left with a majority small enough to induce their resignation, and we are all on the very best of terms now, our public differences never having interfered with private friendships. From the beginning we laboured under two great disadvantages—want of money and time. I think, in judging our labours, this fact should be kept in mind. Our guarantors provided us with a certain amount of credit, but that most potent engine for rapid movement, a balance at the bank, we never knew the blessings of.

Our next step was to form a ladies' committee. Now, although this arrangement, like most others, had not sufficient time for the development of its full working powers, I have only to mention one fact to show how valuable it was, and invaluable it might have been, under more favourable circumstances. It was through the exertions of our ladies' committee that Her Most Gracious Majesty condescended to become an exhibitor by sending us that beautiful statue of the Prince Consort, which still forms a prominent ornament in the Palace at Sydenham. The ladies also collected for us a waggon load of most interesting subjects of art-workmanship of different periods, a collection which was never done justice to, for the simple reason that we were overworked, and could not properly classify and place them. When I find from our minutes that the subject of forming a ladies' committee was never mooted until July the 6th, and remember that the Exhibition opened on August 7th, I am ashamed to think how much more expeditiously things were managed at Blackwall, where the ladies' committee sat, than at Southampton-buildings, our own place of meeting. To Miss Arrowsmith, and the eight ladies who worked so energetically with her, I tender my most respectful thanks, and only hope that, in the event of this meeting agreeing with me as to the desirability of further humble efforts being made to increase the amity between Paris and London, the benefit of their assistance will be had again.

Our chief debates on the committee were about the admissibility or otherwise of certain articles into our Exhibition, which some contended were worthy, and some unworthy of a place in a skilled work collection. A man offered us a monster work in zinc. It had taken him a number of years to make, and it was admitted on all hands that for so unpromising a metal as had been used he had done great things. But the subject was an ambitious one, St. Michael Slaying the Dragon. It was urged, as a merit, that the dragon had seven heads, and, I think, as many tails, and I am not sure how many thousand scales, every one of which had been separately hammered. The work, if admitted, would have been our most prominent article, and as some of us thought very little of it as a work of art,

and even ventured to doubt the wisdom of selecting zinc for the material of so spiritual a work, we had fierce contests over the body of the dragon. Government carried the day by a large majority, and the work, with many others of a like nature, was declined with thanks. But the hydra-headed monster managed to sow his teeth in our committee, and much valuable time, which might have been spent in considering how we could invite a number of Frenchmen to London and make them comfortable, was taken up by grave considerations as to whether or not something which had been done was strictly in order. I have remarked that the exhibitors were very slow in sending in their goods. From various causes our French friends were the chief defaulters in this matter. Before we blame them, however, we should remember that their difficulties were much greater than ours. The whole Exhibition movement was new to them. They were at a distance, and had still to gain confidence sufficient to induce them to part with their goods. In matters of business the French nature is an exceedingly cautious one, and the Paris committee had to work against this national characteristic. As no French goods had arrived we were compelled to postpone the opening of the Exhibition. Well do I remember the hot bustle of the two or three days before the 7th of August, and gladly do I testify to the unanimity of our committee when there was positive right down hard work to be done. We all, from the brilliant and spirited leader of the opposition down to the humble secretary, went at it like Englishmen determined to carry a point. "You can't open; you will never be ready in time," said the Palace officials as they looked along our acres of bare walls and floors on Saturday, the 5th of August.

Well, on the 7th we were not so ready as we could have wished; a few packing cases were still to be seen about; but it has been said that in 1851, 1862, and again in the Dublin Exhibition, such things were not altogether unknown. And our resources were not greater than those of the Royal Commissioners. Only a few of the French goods had arrived, but the rest were promised, and we thought it wiser to open than have a second postponement.

Now, as to the choice of a great personage to open our exhibition. Our committee was a very independent one, and generally received any propositions for seeking patronage with little favour. We applied to two or three of the greatest people in the land, for we ventured to think that our efforts deserved more than a local recognition, and when from various causes these declined, somebody moved, and it was carried unanimously, that we should open the Anglo-French Exhibition ourselves. It was thought, however, that if some great employer, whose name was well-known to the world, would consent to come among us and preside over the ceremony, it would save us from the charge of an impertinent self-sufficiency. One of our number accordingly waited upon Mr. Herbert Maudslay, of the firm of Maudslay and Field, engineers, and that gentleman, assisted by Mr. Henry Maudslay, his cousin, presided at the committee's opening of the Exhibition. The inaugural ceremony was designedly of the simplest description. From the great Handel orchestra prayer was offered up the Rev. Dr. Emerton, who has throughout taken a friendly interest in our proceedings, and the Crystal Palace company's band discoursed sweet music. The chairman and Mr. Henry Maudslay both made capital speeches, in which they adverted to the fact of this being both the first skilled work, and the first International Industrial Exhibition; and touched upon some of the difficulties the committee had encountered in the prosecution of what they called this move in the right direction. The secretary then read a letter from Mrs. Cobden, and offered a few remarks; he was followed by Monsieur Potonié, the secretary of the Paris committee, who delivered a brief, but eloquent oration in French. Other speeches, from French and English gentlemen, followed, and the committee then walked through the gallery with the chairman. In the evening the committee had a dinner, and were honoured with the company of M. Potonié and several other French gentlemen. Most of the daily papers treated the opening of our exhibition as an event, and headed their placards the next morning with the announcement. For the first week or two the number of visitors passing our turnstiles was good, but owing to the lateness of the season, the average attendance at the palace began to fall off, and it was soon apparent to all that the scheme would not pay. People grumbled at the additional charge after entering the Palace, as they always will. The public as a rule like to know what they will have to pay before instead of after entering every place of amusement. To increase the number of visitors to our exhibition and decrease our liabilities, we made an arrangement with the Palace Company to reduce their claim for rent, upon condition of our throwing the gallery open free. Our exhibitors also subscribed towards the same end. The place was filled daily after the removal of the turnstiles, and when the adjudicators went round after all the French goods had arrived, there was but one opinion upon the show, and that was a favourable one. We were criticized upon the small number of our French contributions. But when we remember that, of the seventy whose articles arrived,—some half-dozen names represented large co-operative associations—such as the Tailors' Society, the Opticians', the Lampmakers', and the Carpenters', we find the number of French workmen actually represented equalled, if they did not exceed, that of the English. The principle, that French workmen are willing and anxious to fraternise with their English friends, I maintain was proved, and abundantly proved, by the trouble and expense incurred in sending even those seventy cases of goods to Sydenham. I will go further, and say that we owe them some return of confidence.

As another mode of lessening our expenditure, we countermanded an order which had been given for expensive bronze commemorative medals. 800 of them, however, were completed, so the committee were compelled to take them. The difficult task was then before us,—to divide these 800 medals among something like 1,300 claimants, for we had 1,200 English and 70 French exhibitors, and all had been promised a medal. After some discussion, we resolved to give them as follows: First, to all the ladies who had exhibited; next, to the French exhibitors and committee; and the rest, as far as they would go, to all who came to claim them personally, —preference being given to those who had subscribed towards the lessening of the committee's debt. As you may suppose, some of our exhibitors were very angry, and the task of apologizing for what seemed a breach of faith on the part of the committee I found an extremely unpleasant one. But I feel bound to thank the great majority for the kind manner in which our explanations were received. If our exhibition had been the greatest pecuniary success ever achieved, the *esprit-de-corps*, if I may use the term, of our exhibitors could not have been higher. Almost without an exception, they took the warmest interest in the enterprise, and I was flooded with letters conveying suggestions and advice, which, although they were sometimes, through their great number, a little tiresome to have to reply to, were extremely gratifying, as proofs of the good-will of the writers.

The prize certificates were awarded by a mixed committee of French and English gentlemen, connected in various ways with the arts and manufactures. The French exhibitors held our honourable mention in great esteem, and lists of the prize-holders were given in all the principal Parisian journals. The able correspondent of the *Daily Telegraph* mentioned this fact in one of his letters, and commented upon the great interest our proceedings had excited in Paris.

We closed our exhibition, without ceremony, in the beginning of November, and two hundred and fifteen of the exhibitors sat down to a dinner at the Freemasons'

Tavern on the 5th December, over which you, Sir, were again kind enough to preside. The proceedings passed off pleasantly, and a hope was expressed, in more than one quarter, and enthusiastically received, that we might all, on some future occasion, meet again.

The verdict of the speakers that evening was one in which I feel sure all who have followed our proceedings from the first would concur; that, straightened as we were for want of time and money, we did our best, and that, although the Anglo-French Skilled Work Exhibition was not commercially a success, it was, looked at from any other point of view, not a failure.

PROPOSAL FOR THE FORMATION OF AN "ANGLO-FRENCH ASSOCIATION."

Having told my story, I would respectfully ask to be allowed to point the moral. I think the feeling which is prevalent among those who have been connected with the Anglo-French Exhibition—either as exhibitors or on committees—is one of regret that the work which has been humbly carried on seems about to terminate for want of abler hands to take it up. If this noble Society, which exists for the encouragement of arts, commerce, and manufactures, could be induced to add, as it were, an Anglo-French wing to its plan of action, I feel certain that beneficial results would be attained, not only for the arts and commerce, but the peace and prosperity of the world. It will here be proper for me to state that nobody is at all compromised by my proposition. You, sir, are as innocent of it as any person in the room, and I come here to-night merely to make a suggestion for the consideration of the gentlemen over whom you preside. I would humbly venture to propose, then, that the experiment of binding together in closer union the workmen of France and Great Britain—begun in a corner, undertaken by nobodies, with neither means nor ability, against all sorts of odds—should now be taken completely out of their incompetent hands and carried to its conclusion by the Society of Arts.

The first question that of course occurs to one's mind is, "What has a Society for the Encouragement of Arts, Manufactures and Commerce, to do with bringing English and French workmen together?" That query I will, with your permission, assume to have been put, and proceed to answer it. To encourage arts, you must and do encourage art-workmen; to encourage commerce, you must and do look favourably upon the intercommunication of peoples. Now, upon these assumptions I shall attempt to prove my case. I believe last Wednesday a discussion was held in this room upon the very question of the best mode of encouraging art-workmen. I regret that a previous engagement prevented me from being present at so interesting an inquiry. But I believe, from conversations I have had with different gentlemen connected with the Society, that your experience, sir, has lately been that the encouragement has been chiefly on one side. You do all you can to encourage the workmen, but they do not give such a response as is calculated to very much encourage you. You offer prizes of great value—amounting, I am told, to sometimes as much as five or six hundred pounds in the aggregate—but, from various causes, the competition for them is not spirited. Now, I don't know whether any gentleman last Wednesday expressed what I am about to say, but I happen to know that several art-workmen think that one reason of the non-success in this branch of your operations is, that, for the present day, you are not sensational enough. There is a wish on the part of many to see you make a greater stir. They say that in consequence of things being done so quietly here, a prize from the Society of Arts is looked upon as a very good thing—for good young men. But, from the absence of the very highest class of workmen at some of your competitions, prizes have occasionally found their way into hands which, somehow or other, never manage to carry off many gold medals on Saturday evenings. One notoriously unskilled workman gaining a prize does more to damage the *éclat* attending your distribution, and breeds more indifference to your inducements, than people unacquainted with the tone of art-workmen's society would suppose. The one sin never forgiven among any class of English workmen is want of skill in the particular art professed. "Incapables" are cruelly treated, and held in great contempt; and if one such carries off a prize by accident, the result is mischievous. Again, your show of the articles which are sent in is thought to be too private an affair. There are not so many painters in the country as art-workmen, and yet the Academy overflows every year with both quantity and quality. Why? Because the opening of the Royal Academy is an event; the world and his wife go there, and Brown, Jones, and Robinson feel that they will be "made men," if their productions are accepted and admired. There is a perfect fever of excitement among all *palette-able* people while the hanging committee are at their labours, and the furious denunciations against those gentlemen every year are an evidence of the intense interest felt in the Academy by those for whose encouragement it exists. On the other hand, although I have now for some years been among art-workmen in several branches, I have never yet heard a word spoken against you, sir, nor has anybody in my presence ever assailed the impartiality of the Secretary or any of the gentlemen connected with your Society. I say this is decidedly a bad sign. Why, even over our poor little exhibition we managed to enlist no end of hatred, and I say that was a good sign. Now I would respectfully suggest that there is no better method of encouraging the production of anything than by calling forth competition. It is all very well to say that art workmen are so fully employed that they have no time to compete. Make the carrying off your head-prize an object of ambition—as the Wimbledon medal is to volunteers—and men will find or make time to try for it. In a word, can you not make your competition international? and thus kill two birds with one stone—encourage arts and manufactures, and cement the friendship between the workmen of France and England. It is not for me to say what would be the proper steps to be taken. The work outgrew my capacity some time since, or I would not propose to relinquish it. But some measures should be taken at once. Can there be a grander work than peacemaking? Yes, sir, I venture to think there can, for the reaction of human nature makes it comparatively easy for people towards the close of a period of strife to come forward and preach its cessation. Blessed indeed are the peacemakers. But thrice blessed, in my opinion, are they who, without the incentive afforded by excitement, calmly devote their lives and energies to peace-preserving. Sir, if you induce your Council to promote the inter-communication of Frenchmen and Englishmen, you will be doing more towards the perpetuation of the alliance than any Cabinet minister can do by signing a treaty. The amity between governments can be ended by the stroke of a pen, or a word spoken across a green baize table. A breath can unmake them as a breath has made; but the friendship of two such peoples when they know one another and are intimate, could never—would never be broken. Charles Lamb said he never hated anybody whom he had seen, and we must all have felt that unaccountable hatred to strangers to which he alluded. Well, I firmly believe that a treaty duly entered into with—say the London Chatham and Dover Railway—of which the protocol is a little piece of coloured pasteboard, bearing the words "To Paris and back," is the best treaty in the world for increasing the respect and admiration of Englishmen for their lively and good-natured neighbours. I also think that the Frenchman does not like us less after a few days or weeks spent among us. It is an old assertion that we have much to learn from each other. But, old as it is, the truth must strike anew every intel-

ligent Briton who traverses the magnificent streets of Paris. We English are so apt to wrap ourselves in our own self-sufficiency. We say that a thing that is bad is un-English, one which is good is English. Now I would ask any man who has contrasted the light step, the frank gaiety of the French workman of the poorest quarters, with the awkward gravity, and almost melancholy appearance of too many of their social equals in this country, could we not borrow a French leaf or two in this respect? The Frenchman seems to get more enjoyment out of his life than the Englishman. He often *lives* under circumstances in which an Englishman would think it only incumbent upon him to *exist*. Surely, then, the science of life is a subject worthy of the study of all. The reason I placed my notice on the paper as a proposition for the formation of an Anglo-French Association, instead of putting it in the form of a petition to the Council of the Society of Arts, was because I am ignorant of the position of the Society. It is possible that some impassable barrier exists against every effort to encourage arts abroad or foreign artists; in that case I thought the Council might, perhaps, be induced to imitate the railway companies who wanted to sell coals, and finding themselves stopped by the Act, managed to start a separate association under another name, but with the management principally the same as in their own. I feel sure that an association for the special object of promoting the intercommunication of French and English people would do good. I feel equally sure that if once now and again an Anglo-French exhibition could be got together by the Society of Arts, the results would be satisfactory to that body. I may as well frankly state, as well on my own as my committee's behalf, that we have got to the end of our tether. We can do no more in it. At considerable personal inconvenience, at some expense and a great deal of annoyance, we have commenced a great international experiment. We have succeeded in proving the practicability of bringing French and English workmen together. To get together seventy French exhibitors, hurried, as they were, to make their goods, and representing, as some of them did, hundreds of willing contributors, was an achievement which nobody knows better the value of than the members of the Society of Arts. Now, sir, although we are anxious to have no more to do with the promotion of exhibitions, although we are tired of replying to thousands of letters, and dunning guarantors, will you, gentlemen of influence, who profess to encourage such movements, allow such an opportunity of obtaining the "good-will" of a great scheme for nothing, as the Americans say, to pass away?

Would not the present time, the date of completion of half a century of peace, be a good one to launch a society for the tightening of the bonds of amity? I think it would, sir. This next summer you might invite a number of French gentlemen and operatives to a congress in London to arrange a common ground of action. Next year is the year of the Exhibition in Paris. Take such measures as will almost compel every art-workman in this country to visit that great collection and the city in which it will stand. Depend upon it, any entertainment you might give French visitors next summer in London would be returned with interest, in 1867, to English visitors to Paris. And let the Anglo-French Association charge itself with keeping the friendly ball, thus set in motion, going. Let there be a succession of annually-recurring fêtes. Once a year let there be a dinner in London, to which French guests are invited, and in Paris I feel sure a breakfast would follow. Such an association should manage, if possible, to secure a place for English workmen in the 1867 Exhibition. Hold a preliminary exhibition of such works in London next winter, and at once announce that measures will be taken to enable everybody to visit Paris at rates unparalleled for their lowness. Let monster excursion trains start all through the time of the Exhibition as regularly as they will to Bath or Portsmouth. Instead of "eight hours at the sea side," let the cry be "eight days with our friends the French." If your Council, sir, would make such a movement as I have suggested, part of the regular business, I believe they would thereby encourage arts, manufactures, and commerce; arts, by holding an exhibition at intervals of the highest productions of two most skilful nations, stimulated into active competition; commerce and manufactures, by making two civilized nations personally acquainted with the various means of supplying common wants possessed by their neighbours. We have in this country a Peace Society, and although it aims at the accomplishment of what I consider an impossibility, viz., universal peace, I feel sure that that association does great good, lifting its voice, as it never fails to do at all times when men's passions seem to be running away with their reason. I do not believe in universal peace. The throb of the drum and glorious pomp and circumstance of war strike a natural chord in every human bosom. I do not even believe that war is always a misfortune. Men must die, and there is something, to my mind, very grand in that solemn protest against the innate selfishness of our nature, which makes a man lay down his life for a principle; but be this as it may, I do believe in peace between Great Britain and France. I do so because I believe in the desirability of the progress of civilization and freedom. I do so because I think they have shed enough of each other's blood in times past at the bidding of senseless and selfish men. I do so because I believe the one to be the most polished and intellectual and the other the most honest and practical nation under the sun. No! I do not believe in universal peace while there are despots to be crushed and the downtrodden and oppressed to be upraised, any more than I believe in the possibility of my personally liking any man in the world whom I consider to be mean and despicable. But a close and abiding friendship can and often does exist between two individuals for their whole lives. They bear with each other's infirmities; they are particularly slow to anger, and always believe the best of each other; they respect one another more than any body else in the world, not because they think each other the *ne plus ultra* of excellence, but simply because they are "bosom friends," and never intend to be otherwise. Such a thing among individuals is common enough. I believe it could be the same between nations. Peace has existed for fifty years; but how many times has the lovely goddess shaken her wings during that period? Let the next half-century be one of real friendship, and at its close it would be as easy to get up a war between Surrey and Middlesex as between that land which happens to be on the south and that to the north of the St. George's Channel.

To the wealthy and public-spirited, then, we commend the future care of the little seed we have buried. If they will tend it we believe there will spring up a glorious tree. If so, good! If not we cannot help it. I would reiterate, in conclusion, that in my humble opinion the formation of an Anglo-French Association in close connection with the Society of Arts, for the promotion of amicable intercourse between members of the two foremost nations of Europe, would be an undertaking calculated to encourage the Arts, Commerce, and Manufactures of the world, inasmuch as the constant tendency of such a Society would be to preserve that peace and good-will so necessary to their highest development.

DISCUSSION.

The CHAIRMAN expressed a hope that those gentlemen who were about to enter upon the discussion of this paper would clearly recognise that there were two distinct subjects treated by Mr. Coningsby. The first part of the paper was a history of the Anglo-French Exhibition, held last year, and he (the chairman) would be glad to hear the opinions of those present as to the

reasons why the call was not more widely responded to, as well as suggestions by which the shortcomings of that exhibition might be remedied in any future undertaking of the kind. With regard to the second part of the paper, he would be glad to hear opinions as to the desirability of attempting to establish an Anglo-French Association, and as to the amount of support it would be likely to receive from the different classes of the community in the two countries.

Mr. WHITBING thought little remained to be added to what had already been said in the paper as to the causes of failure in last year's Exhibition. These, he believed to have been the fact of holding the Exhibition at the Crystal Palace, and the short time which the French artisans had to prepare for it. A very general wish was expressed to support that Exhibition, not only on the part of the workmen of France, but on that of the large manufacturers themselves; and the feeling was that they would rather not send their goods at all than send those which did not adequately represent the manufactures of that country. The French committee comprised people of various classes of society, including the editors of the *Siècle*, the *Revue des Deux Mondes*, &c., and the movement was very favourably received and supported by the Paris press generally. In France the union between the working classes and the thinking classes was more close than it was in this country; and he believed if a longer time had been afforded for the organisation of the late Exhibition, in addition to the co-operation of the leading men in French society, it would ultimately have obtained the patronage of the government itself.

Mr. BOTLEY considered that the want of success of the late Anglo-French exhibition did not arise so much from its being held at the Crystal Palace as from the portion of the building in which it was placed, namely, the gallery adjoining the Indian Court, being so little frequented by visitors. It was also possible that the extra charge for admission had something to do with the small number of visitors. If the admission had been by the purchase of a catalogue for a small sum, he believed a much larger number of people, and especially of the working classes, would have visited that exhibition. He was favourable to the formation of the proposed Anglo-French Association, which had been suggested by Mr. Coningsby, and was ready personally to co-operate in forwarding so desirable an object.

Mr. FIGGINS, jun., said it was easy to point out the causes of the failure of these industrial exhibitions, but it was not so easy to indicate the remedy. There were two difficulties to be overcome in getting up these exhibitions. The first was to induce the workmen to come forward, and the second was to make the exhibitions pay. He believed the best way to influence the workmen to respond to the appeal made to them was to interest their employers in the matter, and through them the workmen. He was himself a large employer of labour, and he believed half a dozen words from him to his men would go further than all the speeches and pamphlets that could be put before them. It was for the manufacturers to point out to those in their employment the directions on which their skill could be exercised with the greatest advantage to themselves. On the one hand the workmen wanted some incentive to contribute to these exhibitions; and, on the other hand, the manufacturers wanted something that would tend to the improvement of their productions, and enable them to meet the competition to which they were exposed. With regard to the second feature in the success of these exhibitions—the money return—he believed there would be no lack of it if a mutual interest between the manufacturer and the workman were created. He had himself bought a large number of tickets for the North London Exhibition, and had distributed a considerable portion of them gratuitously to his men; he thus created such an interest in the Exhibition that the rest of the tickets were gladly purchased by them. He thought if this had not been done, few, if any, of the men would have visited that Exhibition. With regard to the policy of getting up another Anglo-French Exhibition, he thought they ought to have a better response in the case of their own exhibitions before they invited the artisans of other countries to join in them.

Mr. PETER GRAHAM, referring to the latter part of the paper, would point out some of the practical difficulties which he considered stood in the way of achieving the objects which the author had in view. In the first place he would refer to the local working men's exhibitions that had already taken place in London, particularly the North London, as one of the first of those undertakings. The success that attended that exhibition in respect of the number of persons who visited it, as well as the satisfactory pecuniary results of the experiment, led to many other exhibitions of the same character in London. For his own part he thought there was scarcely anything in that exhibition which was really worth going to see, and he believed the musical entertainments by which it was enlivened formed the main attraction to the greater number of visitors, and that the receipts would have been nearly as great if there had been no exhibition at all. The West London Exhibition, although the objects exhibited were of far greater merit than those at the North London, was a commercial failure, mainly, he believed, because the managers were prevented by the landlord of the Floral Hall from giving musical entertainments. In that case the guarantors had to meet a deficiency of of about £1,500, although, as he had just said, the exhibition was far superior to the North London, which was a pecuniary success, thus proving, to his mind, that it was not the exhibition alone, but the accompanying attractions, which induced people to pay their money to go to it. His own opinion was that exhibitions of the kind recommended in the paper this evening would have little or no influence upon the art-workmanship of the two countries. Moreover, there were comparatively few articles of importance which were the actual production of one hand, the association of different workmen in various departments being generally required. For instance, a piece of cabinet furniture, if it was ornamented with metal or porcelain, would require ten or twelve different classes of workmen to complete it, and the credit of the production as a whole did not belong to any one individual. On the subject of international exhibitions generally, he thought if they were held alternately every five years in London and Paris that was quite often enough; any shorter interval than that was, he believed, insufficient to mark the progress which had taken place since the previous exhibition. International exhibitions, on the scale on which they had hitherto taken place, were a great tax upon the time, thought, and capital of large manufacturers, and they should certainly not be held too often, or they would not obtain the support of the large manufacturers of the different countries.

Mr. LAVANCHY fully endorsed the views of Mr. Graham as to the desirability of a sufficient interval of time being allowed between each exhibition to mark the progress made in arts and manufactures; if exhibitions were held too frequently their interest and value were lost. On the subject of promoting good fellowship and union between the working classes of this country and those of France, he could only say that anything which tended to promote so desirable an object should have his most cordial support and co-operation.

Mr. DONNECAULT expressed the pleasure he felt in again meeting Mr. Coningsby, with whom on previous occasions he had often disagreed. He was happy to say he concurred in most of what had fallen from that gentleman this evening. With regard to the first portion of the paper, however, he would say that having had considerable personal experience in the struggles and difficulties of those who took part in industrial exhibitions, he did not agree with the remarks that had been made tending to show that a reluctance existed on the

part of the working classes themselves to come forward in this movement. The South-East of London Exhibition, which had just been closed, was visited by upwards of 100,000 people, the major part of whom belonged to the working classes; and he was happy to say that the large manufacturers of that district gave their warm support to that exhibition. He did not agree with Mr. Coningsby when he spoke of the reluctance of the committee to receive the patronage of those about them. He thought a proper kind of patronage, like mercy, blessed both the giver and receiver; he did not mean an offensive kind of patronage, but the hearty co-operation of men of influence and position might, in his opinion, be received without any loss of self-respect. With regard to the second part of the paper, he would express a hope that this Society would give its aid in the formation of the proposed Anglo-French Association, in order that the alliance which had been promoted between the hitherto rival nations might not be merely of a political and diplomatic character, but might be founded upon and cemented by the cordial good fellowship of the people of the two countries, which would be best secured and perpetuated by mutual association for advancing the interests of arts and manufactures.

Rev. Dr. Emerton expressed his general concurrence with the views enunciated in the paper, and hoped the influence of this Society would be given in aiding the formation of the proposed Anglo-French Association, as the best means of promoting the true interests of both nations. He referred to some former efforts of his own in furtherance of this object.

Mr. Webber thought that the appeal that was now made for the co-operation of the Society in this matter amounted to a request to take up that which, having been tried by others, had resulted in failure. If he were asked why these industrial exhibitions had not been attended with greater success, he believed it was in a great measure owing to the fact that the public were beginning to see that such exhibitions were too much made the means of advancing private trade interests, in fact, had too much of the advertising element in them. He agreed with Mr. Graham that the too great frequency of international exhibitions detracted from their value. He considered, moreover, that these great exhibitions were deprived of much of their charm by the frequent exhibitions on the small scale which were now so much in fashion. With regard to giving facilities for the working classes of this country visiting the next Paris Exhibition, he thought the railway companies might be safely left to carry this out in their own way; they would be sufficiently alive to their own interests to promote that object to the utmost of their power.

Sir Thomas Phillips said he had not intended to address the meeting, as he had very little knowledge on the subject of exhibitions, and therefore could not contribute to their instruction on that part of the question; but he rose principally for the purpose of expressing his gratification at the great ability which Mr. Coningsby had displayed in the paper. Whatever conclusions they might come to as to the practical value of the suggestions he had offered, they would all feel as strongly as he did the desirability of union and intercommunication between the people of France and England. He confessed he had some doubts as to the policy of too frequent exhibitions of works of industry. The great object was that the workmen of each country should have the best means of knowing what each was doing, but he could not help thinking that this object would be best effected by the rare rather than by the too frequent recurrence of these international gatherings. He wished, also, to express his own private opinion with regard to the suggestion that had been made that this Society should take up and carry on the movement which had been organised under the circumstances narrated to them this evening. He confessed he thought, at present, it was a matter which the Society could not wisely undertake, nor was it one that came fairly within the scope of its objects. He felt it involved so many important questions, and entailed so large a share of responsibility, that he extremely doubted whether it was desirable to form any such association as had been suggested. It was to be remembered that these proposed efforts pointed to one particular country, and they might be asked—"If France, why not Italy, Austria, and Belgium?" All that had hitherto been done in this direction had been international in its widest sense, and why should we enter into preferential arrangements with one particular country? It was open to those connected with French interests and commerce to say they desired to form an association limited to that particular country, but he could not help thinking it would not be wise for the Society of Arts, occupying the position it did, to take up the question from this limited point of view.

Mr. Galloway held that the improvement of the arts and sciences constituted the wealth of every nation, and was at the bottom of all social and moral well-being. If that was a truism, surely everything that tended to that end ought to be supported to the fullest extent by this Society. He could not conceive why there should be the least objection raised to a greater number of working men's exhibitions, and why they should not be extended as widely as possible. On the subject of the pecuniary losses which had attended some of the local exhibitions, he would say that a trifling pecuniary loss was not to be put in comparison with the benefit those exhibitions were calculated to confer, especially upon the youth of the country who were being trained in the various branches of our national industry. From that point of view alone, industrial exhibitions ought to be encouraged, and they should, in his opinion, be as frequent as possible. For his own part, he thought that once a year would not be too often.

Mr. G. F. Wilson, F.R.S., said he quite felt the difficulty of making these industrial exhibitions pecuniarily successful, and agreed with the speaker who advocated the necessity of obtaining the co-operation of the employers of labour, whose assistance would be most valuable. He also concurred in what had fallen from Mr. Graham as to the undesirability of too frequent international exhibitions; but he must take exception to that gentleman's criticism upon the objects exhibited at the North London Exhibition. He (Mr. Wilson) would say that, though probably his attention was most directed to other objects than those which would engage the notice of Mr. Graham, there were many works there which struck him as being as interesting as any he had ever seen at any exhibition whatever. With regard to the promotion of the friendly intercourse with France which Mr. Coningsby had advocated, he was afraid that to whatever extent the working classes of this country visited the forthcoming exhibition at Paris, there was no chance of their acquiring the light step and vivacious air of the French artizan, which were mainly the results of the influences of climate and race, and could not be acquired.

After some observations from Mr. Stothard upon the various institutions which were devoted to the advancement of arts and manufactures in this country,

The Chairman said that some of the speakers had rather misunderstood Mr. Coningsby, who did not seem, in his paper, to advocate special Anglo-French art workmanship exhibitions, but that they should endeavour to obtain space at the Paris Exhibition of 1867 in which the English and French workmen could exhibit the best specimens of their art in juxtaposition. He entirely agreed with the observation of Mr. Graham, that it was rarely the case that any work of artistic skill could be exhibited as the production of any individual workman, but only as the result of the efforts of several. This objection, however, could be got over by giving the names of all the men who were engaged on the work and stating the part that each took in its production. He did not agree with his friend, Sir Thos. Phillips, in the view he had taken of the duty of the

Society in this matter. His own feeling was that there was a great opportunity before them of bringing the English workman, under favourable circumstances, into contact with the French workman, which he thought should not be lost. Mr. Coningsby had told them that efforts had been made by the artizans themselves to get up an Anglo-French Exhibition, but that, although it had not been a great failure, still they had not the time or the funds to make it a great success. That gentleman now asked the Society to give the influence of its position, and, to some extent, perhaps, the aid of its funds in making another experiment of a somewhat similar kind under the most favourable circumstances, in the Paris Exhibition of 1867. He (the chairman) could not help thinking that if this subject was put properly before the public there would be a considerable response, and he thought that a Society for the Encouragement of Arts, Manufactures, and Commerce could not but feel deep interest in a subject which had been so warmly taken up by the working classes themselves, who should be encouraged rather than checked in their endeavours to promote international good feeling and friendly rivalry between the artizans of the two countries. Allusion had been made to the contrast which was presented between the English and French workman. His friend Mr. Wilson had very correctly attributed that in a great measure to the influences of climate and race. People who could live half their time out of doors naturally acquired a gayer and more sprightly air than those who lived under opposite influences; but if we were wanting in the gaiety of our neighbours this was compensated for by the solid and sterling qualities of our national character, which produced far greater results than the gaiety and good humour of the French. Still he acknowledged the attractiveness of French society, and he believed our workmen as well as those above them would reap advantage from association with others of a more light-hearted and gayer character than their own. Reference had been made to some steps that had been taken with regard to the Paris Exhibition of 1867. When he was told that Mr. Coningsby was about to bring this paper forward, he (the Chairman) made application for space in that exhibition for the display of Anglo-French art-workmanship, but he found there was a difficulty, in an exhibition of that magnitude, in making the arrangement which he had hoped for, viz., that the English and French workmanship should be placed side by side, in order that the comparative merits of each might be appreciated. He found this could not be carried out, as it was necessary that the productions of each country should be exhibited in the regular order of classification. They had been told by one speaker that it was desirable in all these matters that the master should cooperate with his workmen, and there was no doubt that masters might materially assist their workmen if they allowed them to exhibit work which was produced in the ordinary way of business, for it was, perhaps, too much to ask a workman, after the usual hours of daily labour, to expend a further amount of time and skill upon some special article, for the purpose of exhibition. He agreed, therefore, in the importance of securing the concurrence and co-operation of the employers; and he believed it was to the absence of that co-operation that the failure of some of the exhibitions that had already taken place might be mainly attributed. With regard to the question as to how far the Society of Arts could aid them in this matter of the proposed Anglo-French association, he thought the question ought to receive their most careful and anxious consideration; but whatever his own views might be, in this as in all other matters, the course which this Society would be recommended to take, would necessarily be decided by a majority of those to whom it had entrusted the conduct of its affairs. He concluded by moving a cordial vote of thanks to Mr. Coningsby for his most able and interesting paper.

The vote of thanks was then passed.

Mr. Coningsby, in acknowledging the compliment paid him, said several speakers had fallen into the mistake that the object of the paper was to show the advantages of industrial exhibitions, whereas his main purpose was to endeavour to induce the Society of Arts to take up the movement, which had been commenced in the way that he had stated, by promoting intercommunication between the workmen of England and France. He denied that the late Anglo-French Exhibition had been a failure. It was true it had not been pecuniarily successful, but the object was not to make money, but to bring the workmen of the two countries together in friendly rivalry, and in this, he maintained, they had been successful. Looking to the fact that with upwards of £600 offered in prizes by this influential Society last year, only about sixty persons competed for them, and that there were no less than seventy French exhibitors at the Anglo-French Exhibition, which was got up by persons of no influence at all, with nothing to compete for except fame, he thought the experiment that had been made was anything but a failure.

CITY OF LONDON INDUSTRIAL EXHIBITION.

This Exhibition was formally opened by the Lord Mayor, at the Guildhall, on Tuesday last, in the presence of the chief civic dignitaries and a large assembly.

During the arrival of the company the band of the London Rifle Brigade performed a selection of music, and a numerous choir subsequently sang the "Sanctus" and 100th Psalm. The Rev. M. Gibbs (the Lord Mayor's chaplain) then offered prayer, which was followed by the chorus—"The heavens are telling." Mr. W. W. Head, chairman of the committee, read an address with reference to the organisation of the Exhibition; and the Secretary read a report, from which it appears that the Industrial Exhibition originated with a few working men, who, having visited various exhibitions of a similar nature, held in other parts of the metropolis, conceived the idea that it was but just to the artizans of the City of London that the same opportunity of displaying their industry and skill should be afforded to them. Meetings were held from time to time, until eventually the project was sufficiently matured to justify the promoters in bringing it before the public. In July last year a requisition to the late Lord Mayor, inviting his patronage and co-operation, was signed in the space of a few days by upwards of 2,000 working men. A large public meeting was held soon after in Sussex Hall, Leadenhall-street, over which his lordship presided. On this occasion resolutions promising sympathy and support were cordially adopted, and the provisional committee was rendered permanent. Some of the first merchants of the metropolis became guarantors, many others following their example, so that a fund—which commenced with the shilling of the artizan—was speedily augmented to the amount of £3,384 6s. 6d. That entirely relieved the committee from all anxiety as to the pecuniary results of the undertaking. The use of the Guildhall was granted by the Court of Common Council. It is the design of the promoters to make the City of London Working Classes' Industrial Exhibition more beneficial and permanent in its results than any of its predecessors, for it is intended to perpetuate the memory of this latest effort by the foundation of a Public Free Library in the City.

The Lord Mayor then delivered an address; and subsequently a concert took place, in which many eminent *artistes* appeared.

The exhibition has been classified as follows:—Architectural models and designs and drawings; books and bookbinding; curiosities; carvings and turnings in wood and other materials; drawings in crayon and pencil, water-colours, and pen and ink; engravings on wood, metal, &c.; artificial flowers, feathers, and hair;

frames, decorative furniture, and cabinet-work; graining, marbling, and paper-hanging; glass-work for decorative purposes, and cut glass; heraldry, illustrations, inventions for promoting domestic economy, inventions for protecting life by sea, rail, and road; iron and hardware, masonic and other jewellery, leather work (various) and boots and shoes; ladies' work and millinery; medical and surgical instruments; modelling in marble, plaster, and bronze, mechanism (working models), sewing machines, musical instruments, naval architecture, paintings in oil, photography, scientific instruments; stuffed birds, insects, &c., tailoring, wirework watches and chronometers, and miscellaneous.

The Prize Works at the recent Art-Workmanship Competition of the Society of Arts have been lent by the Council for exhibition on this occasion.

HISTORY OF THE BRITISH MUSEUM.

Mr. Gregory is to bring the British Museum again to the notice of the House of Commons next week, and as the readers of the *Journal* may consider it opportune to be reminded of its history, the following account is extracted from the last number of the *Edinburgh Review*:—

How the British Museum originated, we venture to think is now little known, and it will surprise many, even perhaps Dr. Longley, Lord Cranworth, and Mr. Denison themselves, to be told that their predecessors, the Archbishop of Canterbury, the Lord Chancellor, and the Speaker of the House of Commons, were appointed trustees of a public lottery for raising the necessary funds to start the British Museum, in the year 1753, when it was deemed expedient to nominate the highest dignitaries in the kingdom as the chosen instruments for accomplishing what now would be regarded as illegal and immoral. Although Parliament, of late years, with doubtful policy, has sanctioned art union lotteries for circulating works of art, public feeling now would never entertain the idea of founding a National Museum of Science and Art with the profits of a lottery, and certainly no Archbishop, or Lord Chancellor, or Speaker, would be invited to superintend the management of it.

In the year above-mentioned Sir Hans Sloane, Bart., was a very old physician, who lived in the Manor House near to old Chelsea Church, where his monument—an urn embraced by serpents—erected to his memory by his daughters, may still be seen. He was the President of the College of Physicians, and founder of the Apothecaries' Gardens, where the cedars made so fine a feature in the landscape at Chelsea Reach, and he gave his names to "Sloane-street" and the adjacent little square called "Hans-place." Sir Hans Sloane bought this house from Lord Cheyne, and it was bequeathed by him to Lord Cadogan, who married his daughter, and in this house, —to employ the words of the black letter Act of Parliament (26 George II. cap. 22), the same which legalised the lottery—he had, "through the course of many years, with great labour and expense, gathered together whatever could be procured, either in our own or foreign countries, that was rare and curious," at a cost, it is said, of £50,000. In 1749 he had made a codicil to his will, in which he expressed a desire that his collection, in all its branches, "might be, if it were possible, kept and preserved together, whole and entire, in his Manor House, in the parish of Chelsea," *i.e.*, half a mile further west from Charing-cross than the site where it has been proposed to locate his Natural History Collections. The collection, or "Museum," as it is called, consisted of "his library of books, drawings, manuscripts, prints, medals and coins, ancient and modern, antiquities, seals, cameos, and intaglios, precious stones, agates, jaspers, vessels of agate and jasper, chrystals, mathematical instruments, drawings, and pictures, more particularly described and numbered, with short histories or accounts of them, with proper references in certain catalogues by him made, containing thirty-eight volumes in folio and eight volumes in quarto." We beg our readers to note the precise method of cataloguing, which, as will appear hereafter, has been altogether superseded by the trustees. He appointed trustees to sell his collection for £20,000,—also "to obtain a sufficient fund or provision for maintaining and taking care of his said collection and premises, and for repairing and supporting his said Manor House Waterworks coming from Kensington, and premises." His trustees were, in the first instance, to apply to Parliament, and, if Parliament declined the offer, they were to sell it, for the use of certain foreign academies, which were named; and in case the said offer should not be accepted by either of the said foreign academies, his executors were at liberty to sell it "with all convenient, speedy, and advantageous manner." The Act of Parliament which was passed to sanction the purchase of this collection for the nation is still the basis of the constitution of the British Museum. The trustees of that institution then first received their powers and title from Parliament. The office of "Principal Librarian" was then created with the powers and the salary of £1,000 a year, which he retains to this day. The Archbishop of Canterbury, the Lord Chancellor, and the Speaker were invested with the patronage and control of this establishment; and for 113 years this strange constitution has not undergone any material alteration or improvement. The first act of the trustees appears to have been to waive the condition of the site and to consent to the removal of the Museum from the Manor House at Chelsea to any proper place, "so as the said collection be preserved entire without the least diminution or separation, and be kept for the use and benefit of the public, with free access to view and peruse the same at all stated and convenient seasons." For the Act provided that the collections should only remain there until a general repository should be provided for the same, after which the Manor House of Chelsea was to follow the general disposition of Sir Hans Sloane's landed estate. The preamble of this statute ran in the following terms:—"Whereas the said Museum or Collection of Sir Hans Sloane is of much greater intrinsic value than the sum of twenty thousand pounds: and whereas all arts and sciences have a connection with each other, and discoveries in natural philosophy and other branches of speculative knowledge for the advancement and improvement whereof the said Museum or Collection was intended, do in many instances give help and success to the most useful experiments and inventions: Therefore, to the end that the said Museum or Collection may be preserved and maintained, not only for the inspection and entertainment of the learned and curious, but for the general use and benefit of the public," Parliament covenanted to pay for it the sum of £20,000 to his trustees, and the Act we have already described became the law of the land.

But this Act did much more. Powers were obtained to remove to a general repository the Cotton MSS. still remaining "at Cotton House, in Westminster, in a narrow little room, damp and improper for preserving the books and papers in danger of perishing, and not made sufficiently useful to British subjects and all learned foreigners;" also to purchase the Harleian Collection of MSS. for £10,000, to be placed in the same repository with the Cottonian Library. The Act created about forty trustees for these several collections, and incorporated them by the name of "the Trustees of the British Museum," and gave powers to provide a general repository, in which "the said Museum or Collection of Sir Hans Sloane, in all its branches, shall be kept and preserved together in the said general repository, whole and entire, and with proper marks of distinction, and to which free access to the said general repository, and to the collections therein contained, shall be given to all studious and curious persons at such times and in such manner as the trustees shall appoint." The Act also legalised the lottery to raise £300,000 for these purposes. There were to be

100,000 tickets of £3 each, of which 4,159 were to be "fortunate tickets," giving prizes as follows:—1 of £10,000, 1 of £5,000, 2 of £2,000, 10 of £1,000, 15 of £500, 130 of £100, 1,000 of £20, and 3,000 of £10, or a total of £99,000. The Archbishop, the Lord Chancellor, and the Speaker were appointed the managers to see fair play, and the lottery was drawn in Guildhall on the 26th November, 1753, wagers on the chances of the drawing of tickets being specially prohibited.

Thus things "rare and curious" constituted Sloane's Museum, for the use of "studious and curious persons." The objects enumerated are as miscellaneous in character as the contents of the old curiosity shop of some small provincial town. Is there to be found at this time one and the same collector hungry for "chrystals, mathematical instruments, drawings, and pictures?" This original vagueness and multiplicity still haunt the British Museum. While commerce has found it convenient and useful to separate the dealers in books from those in prints, and keep medallists and picture-dealers, and mathematical instrument makers apart, the British Museum Trustees look with horror on any one that shall divide their heterogeneous collections, although they themselves have violated all the conditions of Sir Hans Sloane's will, and separated his "mathematical instruments" from "chrystals, drawings, and pictures!" In a volume in the Sloane MSS. several versions of a plan or proposal for managing the collection are given in detail. It was to be divided into "1° books, prints, drawings, pictures, medals, and the most valuable of the jewels; 2° MSS.; 3° natural and artificial curiosities," which were assigned to different rooms in old Montague House. "Thus the whole collection will be kept together without the other collections interfering." Does Lord Derby, who is one of the Sloane Trustees, know that the whole collection, in spite of Act of Parliament, codicil, and trust deeds, is all dispersed? Not even the thirty-seven catalogues are kept together! Or have the trustees given due effect to the following injunction of the testator "to prevent as much as possible persons of mean and low degree and rude and ill-behaviour from intruding on such who were designed to have free access to the repositories for the sake of learning or curiosity, tending to the advancement and improvement of natural philosophy and other branches of speculative knowledge?"

Pursuing the history of the British Museum, we find that in the year following the passing of this Act, it was proved to be difficult, if not impossible, to get the Archbishop, the Lord Chancellor, and Speaker to meet, and so Parliament passed one of its curious hotch-pot Acts, "for punishing persons destroying turnpike locks," and "making Acts for erecting courts of conscience publick Acts," and "preventing persons driving certain carriages from riding on such carriages," and in it gave powers to render the presence of two of these high functionaries as valid as three, and made seven of the trustees as good as forty.

For fifty years the Museum slumbered on, spending about £2,500 a-year on management, and a few hundreds a-year on purchases, chiefly books aud antiquities; but, in 1805, an Act (45 George III. cap. 127) was passed to purchase the Towneley Collection of ancient marbles for the sum of £20,000, to be open to the "inspection of artists and the curious in the fine arts," on condition that the whole of the said collection should be kept together, and Edward Towneley Standish, of whom the purchase was made, or of his heir or nominees, was made a trustee of the property sold.

In 1816 another great acquisition was made. The invaluable Elgin Collection of marbles and sculptures was purchased by a vote of £35,000, and here again the vendors, Lord Elgin and his successors, were added to the trustees, again increasing the number. This appears to be the last purchase which was accompanied by the creation of a trustee to protect the property he had sold. From the foundation of the British Museum to this period, about £120,000 had been expended on purchases, chiefly consisting of books, MSS., and antiquities. Natural history was hardly recognised by the trustees, for only about £2,500 had been spent upon it. Nothing had been expended for minerals and fossils, or zoology, or botany, or prints and drawings. After that year, some slight purchases were made for objects in these classes, but it was not until after Mr. Hawes' Committee of the House of Commons, in 1835-6, that funds have been systematically devoted to procuring objects of science.

At this time, Parliament having been reformed, public interest began to manifest itself, through Parliament, in the management of the British Museum, which has gone on increasing to the present time. In 1835 and the following year an inquiry was made into the state of the British Museum, which presented ponderous blue-books to the House. The effect of these reports was to cause a largely-increased expenditure, both for salaries and purchases, in the several neglected departments, but these committees did not give greater distinctness to the object of the institution than Sir Hans Sloane's of "rare and curious," and they failed to point out that the origin of all defects in the institution was to be found in its irresponsible management by numerous trustees.

A second Select Committee sat, and in 1847 a Royal commission of inquiry was appointed, and a supplementary commission "for considering various and grave subjects" was added in 1848.

In 1859 Mr. Gregory obtained another committee, which directed its inquiries into the state of the British Museum as being in "hopeless confusion, valuable collections wholly hidden from the public, and great portions of others in danger of being destroyed by damp and neglect," a state which Mr. Gregory assured the House, in 1865, had not been remedied.

. . . .

A decisive definition must be made of the scope and objects of the Museum. The old loose tradition of "rare and curious," and "rarities and curiosities," can no longer be accepted as the vague object of the principal respository of our national collections. The very idea of such a centralisation as now exists is averse to all progress. The Royal Society and the Society of Arts were very good and sufficient institutions a century ago; but these societies no longer monopolise all the subdivisions of human intelligence in science and art, and they have given birth to a numerous progeny of other societies. Nor can the British Museum do so without falling altogether behind the times. As well might the human race have been confined to the Garden of Eden, as well might England forbid emigration to the colonies, as that all that is "rare and curious"—which is now interpreted to mean all objects illustrating all the arts and sciences—should be confined within the narrow walls of Bloomsbury or any single spot. Since the period when the "few rare and curious things" were first assembled in old Montague-house, the Zoological Gardens and Kew Gardens have been made the living representatives of zoology and botany. The Geological Museum has taken charge of geology, if not of mineralogy. The Museum of the Commissioners of Patents and the Institution of Civil Engineers have appropriated objects of mechanical science and Sir Hans Sloane's mathematical instruments. The South Kensington Museum is devoted to illustrate the application of the fine arts to works of industry. The Ethnological Society and the Crystal Palace have assumed the charge of showing the history of mankind. A National Gallery for Pictures and a National Portrait Gallery have been created. The India Office has founded a museum for works of Eastern origin. The Institution of British Architects, the Architectural Museum, and other architectural societies have their collections of objects of architectural art. In fact, every class of objects which the British Museum has collected as "rare and curious," is now studied from a distinct and scientific point of view by numerous independent associations which had

no existence when the Museum was founded. No conceivable extent of space would enable the British Museum adequately to house and represent all desirable objects of science and art for all time. As science and art extend, so is the tendency to sub-divide, classify, and re-arrange their boundaries, and it is adverse to all scientific development to insist upon principles of concentration and limitation accidental to their origin and antagonistic to all progression. If the nation desires to have collections worthy of it, the present collections of the British Museum should be forthwith divided into the following distinct branches, each sufficiently enlarged:—

1. Books and MSS.
2. Pictures and drawings.
3. Antiquities; including vases and coins.
4. Zoology, and perhaps Mineralogy together.
5. Botany.
6. Ethnology.
7. Mechanical Science, with Mathematical Instruments, and the like.

Not only would the development of each division be promoted by separation under a proper executive management, but the utility of the collections would be greatly increased. They would be vastly more useful even to the few chosen scientific persons that use them, and a hundred times more used by the public at large. The connection of the objects with the library, always put forward as necessary, cannot be logically maintained, and is only a pretence.

Moreover there is a metropolitan view of the local position of such collections which must not be overlooked. Although the collections are national, being made for the use of the nation at large, and not for the metropolis only, still the metropolis, with its three millions of population, being a seventh of the whole country, has peculiar claims to have its convenience consulted. However theoretically central the British Museum may appear on the map, it is gradually ceasing to be convenient of access to the greatest numbers. It matters little to those who seriously study the collections where they are placed,* but to the public at large it is important that the respective collections should be distributed in different sections of the metropolitan district where they can be seen most conveniently by the greatest numbers, and opportunity will be afforded to these greatest numbers by the railways which will encircle London in two years. Places on these lines will be within reach by trains starting every five minutes, and there is no doubt that if the Natural History Collection were transferred to the Regent's-park, the Ethnological Collections to the Victoria-park, the portraits sent to the National Portrait Gallery in the south of London, and the mediæval antiquities to South Kensington, these objects would afford instruction and pleasure to thousands, rather than to hundreds only in Bloomsbury. The drawings of the old masters should be transferred to the National Gallery when we have one worthy of the name. The library and sculpture galleries, with the vases, coins, and other antiques, would then appropriately occupy and fill the present edifice with one of the noblest collections in the world.

PARIS UNIVERSAL EXHIBITION OF 1867.

M. Duruy, the energetic Minister of Public Instruction, has defined what he proposes to do in order to carry out the intention, declared some time since, of including in the French department of the coming Universal Exhibition the products of intellect as well as those of industry. In a letter addressed to M. Le Play, Commissaire-Général of the Exhibition, the Minister says:—"It is not intended to compile an encyclopædic *resumé* of human knowledge, or even to write a complete history, but a review of the progress of intellectual culture during the last twenty years." And he then proceeds to give the programme of the reports to be drawn up for the Exhibition by scientific men, on their own responsibility, but under the sanction of the government, under the three following heads:—1st. Progress accomplished in the mathematical, physical, and natural sciences, to include geometry, analysis, mechanics, astronomy, and geodesy; physics and chemistry; geology and palæontology, botany, zoology, anthropology, general physiology, medicine and surgery, sanitary science, rural economy, and the veterinary art. 2nd. Progress accomplished in the moral and political sciences in their relation with the wants of society, including public rights, administrative rights, civil and penal legislation, political economy, and the rights of individuals. 3rd. Character and tendencies of French literature: comprising *belles lettres*, poetry, the theatre; philosophical doctrines; historical labours; archæological discoveries. To this collection of reports, adds the minister, will be attached, as a natural appendix, a collection of objects chosen with the view of illlustrating, in the most interesting manner, the results of scientific missions and of archæological researches carried on during the same period under the auspices of the Ministry of Public Instruction. M. Duruy repeats the hope expressed in his first announcement that other countries will do the same as France proposes to do for the exhibition of the results of their mental and moral progress.

The Imperial Commission has published a list of the foreign commissioners appointed to the Exhibition, and the names that appear therein show the growing interest which is taken abroad in such matters; the Austrian Commission is headed by an Archduke; the Belgian has for President the Comte de Flandre, in place of his brother, now Leopold II.; the Portuguese has the father of the king at its head; the Prussian, the Prince Royal; Sweden and Norway, Prince Oscar; and England, as is well known, the Prince of Wales. Amongst other facts may be noted the appointment of Midzou Hyoumino Kami, Daïmio and President of the Council of Gorodjos, at Jeddo, as chief of the Japanese Commission, and of M. Gréhan, consul for Siam at Paris, as president for that country. China, Morocco, Peru, and Persia are represented by residents in France, appointed, in the first place, by the French Imperial Commission, and in the others by the native authorities.

Russia, which in consequence of the war in the Crimea, did not take part in the Paris Exhibition of 1855, seems likely to be well represented; special committees have been appointed to receive the contributions of exhibitors at St. Petersburgh, Moscow, Riga, Helsingfors, Warsaw, Kharkoff, Odessa, Tiflis, Orenburg, Ormsk, and Irkontsk, and the government defrays all charges between these places and Paris. As regards works of art, the Russian Commission requires that they shall be sent to the Academy of St. Petersburg before the 1st of September; they will there be exhibited specially, and will only be sent to Paris after the approval of the council of the academy.

The Imperial commission has adopted the suggestion of including retrospective art in the Exhibition of 1867, not separately, as proposed, but as an intrinsic portion of the contents of the building in the *Champ de Mars*, in the words of the Ministerial announcement:—"The gallery of the history of labour will receive objects produced in the various countries from the earliest period to the end of the eighteenth century." The contributions of the various nations will, as in all the other classes, be arranged separately, and in connection with the other articles exhibited by the same country, and will at the same time be found in their places in the class to which they belong; there will thus be a zone or oval gallery devoted to antique carving, another to porcelain.

* When the School of Design was at Somerset House, which is a perfectly central situation, the fees paid by the students averaged only £300 a year; now, at South Kensington, apparently a less eligible site, they produce £2,000; but the schools have been immensely improved in every respect.

a third to glass, a fourth to enamels, a fifth to furniture, and so on, each geographically and chronologically arranged. A special sub-commission is appointed to carry out the object in view with respect to France, and its composition promises success. Count Nieuwerkerke, superintendent of the Beaux Arts, is appointed president, and Count de Laborde, the keeper of the Imperial Archives. M. de Longpérier, conservator of the antiquities in the Louvre, and M. du Sommerard, the director of the Museum of the Thermes and the Hôtel de Cluny, all members of the Imperial Commission, which has the charge of the historic monuments of the empire, together with M. Lartet and Baron Alphonse de Rothschild, are the other members. The commission is empowered to appoint special committees to carry out the work. Foreign commissions are invited to aid in the completion of this retrospective gallery. One of the first duties of the new commission will be to draw up a scheme of the products which will best represent the industry of France at various epochs.

The members of the Scientific Commission, whose duty it will be to report on the various departments of literature and art, are being named; M. de Quatrefages de Bréau, Pruner Bey, formerly physician to the Viceroy of Egypt, and M. Lartet are appointed in the section of anthropological and ethnological history. The report is to be submitted to the Imperial Commission before July, 1867.

The Imperial Commission has finally decided on accepting the propositions made respecting the introduction of various national recreations, including, amongst other things, music, dramatic performances, and popular entertainments. An International Club is another feature recently decided upon, and in connection with it a kind of arcade for the supply of all the wants of travellers. Lastly, the Commission announces that it is about to adjudicate respecting the restaurants, cafés, pastrycooks' shops, and other places for the sale of articles of food and drink, which will occupy a gallery surrounding the Exhibition building. Each exhibiting nation will have a portion of this gallery, and, says the commission "will thus have the opportunity of making known the viands, drinks, and the various arrangements which apply to them: but each will be strictly confined to its national character." The contractors will have to pay a fixed rent per square metre, and to find everything for themselves but mere walls. Below the restaurants and other establishments will be a range of cellars let on like conditions.

The following document, dated 1st January, 1866, has been issued by the Imperial Commission —

List of the Establishments which French Exhibitors intend to Place in the Park.

Among the arrangements of the Universal Exhibition of 1867, which will be specially useful and attractive, may be mentioned the agricultural and industrial establishments which French producers desire to exhibit in the park of (30 hectares) 74 acres, situate around the Palace. The following is a list of those establishments of industries, which will be particularly interesting as showing processes, many of them new, and also on account of the life and movement which they will impart to the Exhibition :—

Treatment of silver-lead ore, and testing of lead.
Preparation of zinc ore, with a novel apparatus for the condensation of the metallic vapours.
Drawing of iron and lead pipes.
Manufacture of white metal (white zinc).
Manufacture of sodium.
Foundries for bronzes and ornamental castings.
Forge for scrap-iron.
Manufacture of tin by a new process.
Glass-works, with the furnaces, exhibiting the cutting of crystal and pebbles for spectacles.
Cutlery works.
Beating out of copper, aluminium, and platinum.
Type foundry, and stereotyping.
Distilleries for spirits, essences, &c.
Manufacture of chocolate, with an establishment for the consumption of the products on the premises.
Manufacture of preserved fruits and vegetables.
Model (wash-house) bleaching-ground.
Silk-worm nursery, situate in the centre of a plantation of mulberry-trees.
Wine-press in the vicinity of a vine.
Perfumery works, extracting perfumes, partly from flowers grown in the park.
Farms appertaining to the various agricultural districts of France, with stables and apparatus shown in action.
Examples of Imperial farms, with picked animals; plans and statistics relative to the results obtained.
Dark chamber (camera obscura) for experiments in the measurement of light.
Complete photographic studio, exhibiting to the public the various operations of the laboratory.
Chamber of natural philosophy and observatory furnished with instruments by which visitors may become acquainted with certain scientific operations known only to few persons.
Monumental Campanile, with clock, bells, and chimes.
Models of various kinds of buildings in wood, stone, brick, pottery, artificial marble, concrete, metals, &c.
Examples of houses, showing the improvements introduced in France, with a view to health and comfort in cheap dwellings.
Kiosks, and chalets, fountains, vases, railings, fences, arbours of trellis-work, iron seats, rustic bridges, &c., for the decoration of gardens.
Hot-houses, containing the finest specimens of flowers and fruit.
Aquariums for rearing fish; ponds for aquatic plants.

Numerous clumps of trees and shrubberies will contribute to the embellishment of the park; and the turf will be kept fresh by means of pumps and other apparatus.

A lighthouse, 66 metres high, and other lighthouses of different heights, will every night throw their light upon the park and the banks of the Seine.

Lastly, the park will contain an international theatre, where will be performed pieces in the various dramatic styles of all countries. An international concert-hall, in which the musicians of the different nations will perform. An international club-room, which will serve as a place of meeting for the exhibitors; and on the ground floor will be various shops, &c., in which visitors arriving by the railway will find accommodation for dressing, washing, &c.

NATIONAL AND LOCAL PHOTOGRAPHIC PORTRAIT GALLERIES AND MUSEUMS.

In July, 1863, Mr. Lachlan Machlachan, of Manchester, made public a plan (noticed in the *Journal*, vol. XI., page 616) for the systematic collection and preservation of authenticated photographs of distinguished individuals, by the establishment of national and local galleries or museums, under corporate or other authority and control. He now states that the Corporation of Manchester have adopted the suggestion, and have authorised him by a formal resolution "to make application to leading photographers for donations, for the purpose of the photographic museum of negative or transparent portraits of distinguished individuals of this or foreign countries, upon the distinct understanding that the corporation guarantee that any negatives or transparencies which may be liberally contributed shall not, in any case, be used for any private or trade purpose, but shall be systematically and carefully preserved, and used only with the express authority (in writing) of the corporation, for public purposes."

In order that the utmost security may be given for the permanency of the portraits, the adoption of two methods is proposed. By the first, the portraits would be transferred and enamelled by the process of M. Lafon de Camersac, or by other similar methods; and, as a guarantee of authenticity the corporate arms, with the signatures of the mayor and town clerk, as well as the autograph of the individual, would be burnt in on the reverse side. By the second method, negatives or positives by transmitted light would be hermetically sealed by a process devised by Mr. Daniel Stone, chemist, of Manchester.

It is hoped that photographers generally will assist in establishing, in a creditable manner, an institution which will secure such important results, which will at once throw a lustre upon their profession, and remain a monument of the great value of the art.

Mr. Machlachlan invites contributions from photographers, observing that it is of the highest importance to secure the likenesses of all distinguished persons whose portraits have been taken, from the earliest days of photography. In all cases the gift or loan of the negative will be desirable; but, if that be objected to, a positive, by transmitted light, will be received. In this case it should be accompanied by an unmounted print from the negative. It is very desirable that the portraits selected for enamelling should be uniform in size, the head to be $1\frac{1}{4}$ inch, filling an oval of $3\frac{1}{2}$ inches, and, if a transparency be offered, these dimensions should be adhered to; but the negative is preferable. Every portrait will bear the name of the contributor. An official receipt will be given for the same, and lists published in the photographic journals, periodically, of all contributions received. In transmitting negatives or transparencies, the names and designations of the portraits should be supplied.

Communications should be addressed to Mr. Machlachlan, Cross-street, Manchester.

MUSICAL EDUCATION.

The following letter has been addressed to the editor of the *Pall Mall Gazette*:—

SIR,—The *Journal of the Society of Arts* informs us that its Musical Committee has been continuing the inquiries to which reference has been already made in your columns. The information they have collected is very valuable, but there is one aspect of the question which has been almost wholly overlooked by the committee and their advisers, to which, as I think, the attention of the public ought to be directed. After a period during which the love of music was derided as a weakness, fit only for the feebler intellect of women, and in men as leading only to low company and vice, we seem to be gradually coming back to the old ideas of the sixteenth century, when to sing at sight was held an almost necessary accomplishment for a gentleman. It is now the commonest thing in the world to hear a cultivated man lament that he was not taught to play or sing when he was a boy. Oxford owns a baronet as her professor of music, and Edinburgh owns a baronet's brother in the same capacity. An earl's son "conducts" a large amateur orchestra. Even the public schools have caught the soft infection, and Eton and Harrow boys are not ashamed to give concerts to their admiring friends. To insinuate to a gentleman that he is incapable of knowing one tune from another is almost as insulting as to hint that he is incapable of understanding a joke. Every little town and every London suburb has its choral society, and almost every church its amateur choir; every drawing-room has its pianoforte; and, alas! almost every evening has its "little music." In fact, music has become a recognised element in English life, and its culture is regarded not only as a source of profound and lasting pleasures, but as a powerful instrument for refining and ennobling the mind.

Nevertheless, about the last thing that we think of is the ensuring a supply of thoroughly capable musical teachers and professional performers to meet the ever-increasing demand. Trusting to the great popular maxim about the demand ever calling out the supply, it never occurs to us to look a little into the facts of the case, or to inquire whether capable instructors for our children, and "artists" for our entertainment in public, can be supplied in unlimited quantity by a certain law of nature. The oddest thing, too, is the feeling with which we regard the members of the musical profession themselves. A teacher or singer is expected to be a musician and nothing more. If he has learnt his business, nobody, as a rule, thinks of expecting anything more from him. And yet we are all of us agreed in regarding the musical art as the expression of the purest and most elevated emotions of our nature. We look upon the masterpieces of the great composers as among the noblest and most surprising achievements of human genius and skill. We are never weary of the oratorios which embody the most sacred events in the history of our religion, and would rather sweep away every sermon and every theological book that is printed than lose Handel's "Messiah." Music vulgarized or turned to the purposes of vice is regarded as something desecrated; as a divine gift designed for the cultivation of all that is best within us, and thus doubly debased when made silly and contemptible. But as to the class of men and women on whom we depend for the study, performance, or creation of what we so highly esteem, it never seems to occur to us that their general personal qualifications must materially affect their influence for good or ill in their special work. Playing upon an instrument is treated as if a man played only with his fingers, and singing as if he sang only with his throat. Admitting in general talk that in music expression is everything, it does not occur to us that a musician cannot express that which he himself neither understands, thinks, nor feels. Anybody, we know, can learn to weigh sugars and to measure calicoes. I have heard, indeed, an enthusiastic London shoemaker maintain that of all the shoemakers in existence only a few are made capable of real shoemaking by nature. But this is not the general belief of the wearers of shoes. We know that in the callings not termed "liberal," success is not dependent on those intellectual and moral qualifications which are specially called into play in the liberal professions. When, however, the education and status of musicians are concerned, all our common sense seems to forsake us; and we assume that no higher qualifications are necessary for the player, the singer, and the teacher than for the journeyman who works on pianofortes, or the engraver and printer of musical publications.

Such being the popular theory, it is hardly a matter of surprise that the real want of the musical profession has not been touched on in the examinations of the gentlemen who have been giving evidence and opinions before the Musical Committee of the Society of Arts.

The importance of teaching the pupils one or two foreign languages for professional use has been dwelt upon, but no one seems to have probed the subject below the surface, no one has shown to the committee that a mere improvement in the purely professional teaching of academies will only cure half the evil, and that what is wanted is a thorough general education and cultivation of musical teachers and performers. No "Royal Academy of Music" can be worthy the name, or worth spending the national money upon, which neglects the training of its pupils as men and women, and devotes itself solely to the manufacture of pianoforte players, violinists, and vocalists. The classes of English life which furnish the members of the musical profession are not themselves in a position to supply a good liberal education to their sons and daughters. They cannot afford anything beyond a very unsatisfactory schooling while the embryo musicians are still boys and girls. The mere expense of boarding,

lodging, and clothing the young musical student is often a serious strain upon their slender finances. In fact, it is often because an intelligent boy or girl, who shows some fondness for music, can be set up as a "professor" at a small cost that very many young people are brought up to music, as they might be brought up to any common trade, by way of earning a livelihood.

Such being my view of the case, I am compelled to dissent from the opinion expressed before the committee to the effect that the working principal of any soundly-constituted Academy should be a professional musician. For certain it is that the success of the best-planned and best endowed establishment must depend materially on the qualifications of its working chief. What is wanted is a man who will do for the education of musicians what Dr. Arnold did for Rugby, and indirectly for English education generally; and various reasons combine to lead to the conclusion that such a chief ought not to be a professional musician. If a renovated Academy is to conciliate the respect and regard of the musical profession as a whole, it must be absolutely free from all suspicion of any one party influence, whether national or sectional. But every professional musician would certainly be supposed to be the representative of some one particular party, country, or musical school; and, however dispassionate and liberal his character, he would find it all but impossible to act with perfect independence, or with that unbiassed authority which nothing less than an independence, not only real but universally admitted, could ensure. None but a thoroughly determined, enlightened, and personally conciliatory non-professional man could have power to control the antagonisms which exist in the musical profession in all countries, and especially in our own, which owes a large number of its ablest performers and teachers to foreign races.

It implies, again, no slur upon professional musicians to argue that their calling is not generally favourable to the cultivation of that administrative ability which is precisely the qualification most needed in the head of an institution involving many exceptional difficulties of its own. To administer properly a great musical Academy, a principal ought to be hampered by the claims of no other regular occupation. It would require his daily attendance to an extent incompatible with the fulfilment of any other regular obligations; and unless he could thus devote himself without reserve to the authoritative superintendence of the work both of teachers and pupils, he could not possibly do justice either to the Academy itself, or to the State which found the funds, and appointed him to his office. Such a chief would of course have nothing to do with the direct legislation of the institution, which ought to be the work of the Committee of Council on Education; and in the actual administration of the institution he ought to be assisted by the advice of a council of the professors. The whole of the musical instruction ought to be in the hands of professional musicians, chosen among the best of the profession, without distinction of nationality, provided only that one uniform ideal of musical excellence was recognized in every detail of instruction,—a merit which the present Academy has by no means attained, and which would be practically impossible if its government were in the hands of a professional man.

Whether the efforts of enthusiastic amateurs will succeed in persuading the present Ministry to place a sufficient sum for the creation of an Academy worthy of the country in the hands of the Council of Education may be a matter of doubt. As Sir George Clerk stated to the Committee of the Society of Arts, it is simply a question of demand and pressure. At any rate, the concession must come at last; and in the meantime, the more thoroughly the question is discussed under its various aspects, the sooner we may hope to see a serious attempt made to remedy the present most unsatisfactory state of affairs.—I am, Sir, your obedient servant,

J. M. CAPES.

Fine Arts.

RENOVATION OF THE CONCERT-ROOM AT THE CONSERVATOIRE OF PARIS.—This theatre, of which a description was given in the notes respecting the Conservatoire published not long since in the *Journal*, has been completely renovated and decorated, in the néo-Greek style, by M. Adolphe Lance, and presents a marked contrast in appearance to that which it exhibited last year, when it was faded and dirty in the entrance. The back of the stage, which forms a hémicycle in ten panels, is decorated with figures of Apollo and the Muses, painted in wax, by M. Mazerolle; the pilasters which support the roof of this portion are ornamented with lyres and laurel-wreaths, in light *rouge antique* and bright yellow picked out with blue and powdered with stars. On the ceiling itself are six figures of genii supporting escutcheons, on which are the names of Haydn, Beethoven, Mozart, Gluck, Bach, and Handel. On the panels of the boxes are the names of Rossini, Cherubini, Mendelssohn, Weber, Méhul, Boëldieu, Orpée, Grétry, Spontini, Donizetti, Hérold, and Halévy. On the front of the balcony are busts of Æschylus, Corneille, Racine, Molière, Crebillon, Marivaux, Beaumarchais, Voltaire, and Regnard. A great improvement has been made in the arrangement of the seats, at the sacrifice of twenty places out of nine hundred.

ANNUAL COMPETITION AT THE PARIS SCHOOL OF FINE ARTS.—The second competition amongst the scholars of the school, for prizes awarded by juries of their fellow students, took place not long since. This kind of competition is novel, and extremely interesting to the young men themselves and all who take an interest in Art education. The manner in which it is conducted is as follows:—Each *atelier*, of which there are eleven in the school, three each of Painting, Agriculture, and Sculpture, one of Engraving, and one of Die-sinking and engraving on precious stones, elects five of its members to form a jury, and the juries have the power of awarding three prizes of 300fr., 200fr., and 100fr. value respectively to the works of the adjoining *atelier;* thus, to take the case of painting—the juries elected by the pupils of M. Cabanel and of M. Pils judge the works produced in the *atelier* of M. Gerome, and so on. There were thirty-three prizes to be distributed, but the young jurors withheld the first prize in one case; in another they added an honorary vote, for the designs of a young sculptor named Boulanger, who had died during the twelve months; and in a third they voted a third-class prize *ex-æquo* between two competitors. Of the prizemen, one-third received awards of the like kind last year. The productions were exhibited for three days before the prizes were awarded, and there is no doubt that the new system adopted for the School of Fine Arts has swept away that mannerism—that scholastic servility—which was the reproach of the old system. Nothing can be more unlike than the styles of the three Professors of Painting—MM. Cabanel, Pils, and Gerome; and there is no appearance in the works of their pupils that either of the masters has attempted to force his manner upon those who are placed under his guidance. The works of the pupils included every kind of painting—history, the *figure genre*, landscape, portraiture, dogs, flowers, arms, stuffs, and ornaments. M. Guillaume, lately one of the professors of sculpture in the school, has been appointed to succeed M. Robert-Fleury, as general director of the establishment.

THESES IN ART.—The Belgian Academy of the Fine Arts has announced the following subjects for competition for the current session:—The History of Mural Painting in Belgium, and its polychromatic application to Architecture, with indications of the characteristics and methods of each epoch and of each school. Appreciation of Rubens as architect. Antwerp and Brussels possess many buildings of which the plans are attributed to

Rubens; is such tradition authentic, or is the style of such buildings only to be attributed to the influences produced by the works of the great Flemish master? Analysis and appreciation of (from the double points of view of science and of art) the principal methods of teaching drawing which have prevailed from the time of the ancients to our own—their value and influence. The origin and organisation of the church schools (Maîtrises des Eglises) in Holland and the province of Liège. What share had they in the progress of musical art, and what were the causes of their prosperity and decay? The prizes offered are:—For the first subject, 1,200 francs; for the second, 800 francs; and for the third and fourth, 600 francs each, and the theses, which may be written in French, Latin, or Flemish, are to be sent in by the end of May.

Commerce.

CONSUMPTION OF SUGAR.—Messrs. Travers give the following as the present consumption of sugar per head in different countries:—England, 41½ lbs.; United States, 31½ lbs.; France, 14½ lbs.; Zollverein, 9 lbs.; Austria, 4 lbs.; and observe with regard to the place of Austria at the end of the list, that that country is still in the midnight gloom of protection, and, in consequence, her manufactures are petty, her resources are undeveloped, and her people are poor. In England, on the other hand, although there is not yet free trade in sugar, this is about the only article on which protection still exists, and the extraordinary increase in the wealth of the country since 1844, entirely due to a liberal commercial policy, has made articles that were looked on as luxuries by our fathers, and which are still entirely out of the reach of all but the rich in countries with a protective tariff, necessaries of life to us.

SUGAR TRADE OF THE UNITED STATES.—The total receipts of foreign raw sugar into the United States, not including the states on the Pacific, for the year ending December 31, 1865, were 362,243 tons, against the receipts in 1864 of 214,699 tons: in 1863, 243,137 tons; in 1862, 247,015 tons; in 1861, 242,908 tons; and in 1860, 341,532 tons, and the consumption of foreign in 1865 was 345,809 tons, against a consumption of foreign in 1864 of 192,660 tons; in 1863, 231,308 tons; in 1862, 241,411 tons, in 1861, 241,420 tons; and in 1860, 296,950 tons, while the total consumption of foreign and domestic cane sugar in 1865 was 350,809 tons, against a total consumption in 1864 of 220,660 tons; in 1863, 284,308 tons; in 1862, 432,411 tons; in 1861, 363,819 tons; and in 1860, 415,281 tons, being an increase in the total consumption of 1865, as compared with that of 1864, of 130,149 tons, or nearly 59 per cent. While the consumption of sugar has frequently been larger than that of the past year, when the productive fields of Louisiana yielded their heavy crops, the consumption of foreign sugar was never so great as that of 1865; the nearest approximation to it was in 1860, when 296,950 tons were withdrawn, but the deliveries last year exceeded those figures by nearly 50,000 tons. The consumption of raw sugar in California and Oregon the past year is estimated at 11,000 tons. The continued high prices which have ruled for the imported article, have had the effect of pushing the manufacture of maple sugar, in its season, to its utmost limit. The crop of this description last year was quite large, and the estimates that are made of 27,000 to 29,000 tons, are probably not far from the actual result. The manufacture of sugar from the sorghum, the beet, and Indian corn, is yet in its infancy; and the quantity made from these plants last year was so small that no note can be taken of them. It will thu be seen that the total consumption of raw sugar of alls kinds in the United States may be stated at 412,000 tons, against a total consumption of all kinds in 1864 of 280,500 tons, being an increase of 131,500 tons, or nearly 47 per cent.

COAL AND TIMBER IN JAPAN.—Mr. Enslie, in his commercial report on the trade of Hakodadi for last year, says:—"Several mines are at present being worked in the island of Yesso, although, owing to the primitive system adopted by the Japanese, they are of little importance. A new coal mine has lately been discovered in the neighbourhood of Iwanai, in the north-west part of the island; it is said to contain coal of a very good quality, and if properly worked, might produce coal very far superior to that of the other parts of Japan. This mine is the first one worked according to the European system, and promises fair for the future. The island of Yesso is thickly covered with immense forests, containing numerous kinds of wood admirably adapted for building purposes; oak and ash come from the interior of this island. A small export trade has been carried on in this article by one of the British merchants at this port, who has also erected a steam saw-mill. As yet, little business has been transacted with the Japanese, but there can exist no doubt that these endeavours will be ultimately crowned with a brilliant success, and that the Japanese will speedily appreciate the immense superiority of machinery over manual labour."

Colonies.

PROGRESS OF QUEENSLAND.—Six years ago there was a mail but once a fortnight from Queensland to Sydney, there is now a steamer leaves daily for that port. In 1859 the banks of Fitzroy River were unknown to white men, and Rockhampton on its banks is now a fine and thriving city. The greater part of the country from Rockhampton up to the Gulf of Carpentaria has been taken up by squatters, and gold fields and copper mines are being worked upwards of 200 miles from Keppel Bay. Railways are gradually usurping the occupation of the bullock and horse-dray. The electric wire is extending itself in places which were not heard of six years ago. There are now in operation a Brisbane Gas Company, a Queensland Steam Navigation Company, a Queensland Insurance Company, many cotton and sugar companies, a quartz crushing company, two copper-mining companies, and numerous building societies. All these companies report favourably of their progress, but not one of them was in existence six years ago.

NEW SOUTH WALES FINANCE.—The debt of this colony is said to be over eight millions sterling, the interest of which amounts to about £1 per head for every man woman and child. The deficiency for the year 1863 has been ascertained to have been a little under £400,000. This has been met by the Treasury of the late Government by the issue of the Treasury bills. The deficiency for 1864 was a little over £400,000, towards meeting which Parliament has authorised the issue of short-dated debentures; none of these have been sold, but the government were indebted to the banks for the amount. The deficiency for the present year is expected to be very small, in consequence of the savings that have been effected, and at the end of 1866 it is expected there will be a surplus of £47,670, but in the event of expenditure for the minor roads being forced on the Government, there will then be a deficiency of £49,219. In order to provide for the deficiencies of 1863 and 1864 it will be necessary to have recourse to increased taxation.

Obituary.

GODFREY SYKES, the decorative artist of the South Kensington Museum, died on the 28th February. Up to the present time the world has known little of this artist, but it will know a great deal more in a few months,

and appreciate him still more in years to come. It is hardly too much to say that, with perhaps only one exception, he was, *par excellence*, the decorative artist of his time in England, who will have founded a style which will hand his name down to posterity. Already a few who have seen his decorative terra cottas, which have been erected on the new buildings for the South Kensington Museum, and who are well qualified to judge, consider the work a feature of the time. About five years ago Mr. Sykes came from the Sheffield School of Art, where he had been a student, and pupil-teacher, and master in succession, to assist in realising the Prince Consort's plans for the building in the Royal Horticultural Gardens, and he undertook the decoration of Capt. Fowke's arcades in those Gardens. His success with the arcade in the Conservatory, the prettiest building of the kind—which has been engraved in the *Illustrated News*—and the columns of the south arcades, gave an impetus to the revival of terra-cotta, which Mr. Barry, A.R.A., and others, have largely used at the Charing-cross and Richmond Hotels and other places. But Mr. Sykes' greatest achievement is the production of a series of columns now being erected in front of the new Lecture Theatre at the South Kensington Museum, which, for style and size, are among the most beautiful works which have ever been produced, and are worthy to be placed in the Certosa, at Pavia, or the Hospital, at Milan. These columns were Mr. Sykes' latest work, and as he was breathing his last they were being fixed in their places. His faith in art was based on a strong reliance on Michael Angelo, Raffaelle, and their immediate Italian predecessors. He used to groan at the want of faith in artists. Whilst his art resembled his great masters', it was no weak servile version, but his own. Besides being a sculptor and modeller, with a fine sense of proportion in architecture, he was also a skilled painter, and could use his brush with rapidity and decision, and he has been, perhaps, the first artist who has ventured to take the mere structural forms of ribs and bolts of iron-work and make them decorative on their own surfaces. Specimens of his success in this division may be seen in the south court of the Kensington Museum. Just before his death he had nearly matured the designs for the decoration of the new refreshment rooms, in Majolica, a kind of work which has not been attempted in modern times, except in the Queen's dairy at Frogmore. Mr. Sykes is the most eminent designer that has been produced by the National Schools of Art, and is the pride of his native town, Sheffield. Happily he had instilled his principles into several of his scholars, and something like a school has been formed to perpetuate his inspiration. He was only in the forty-first year of his age, and his death is the third great loss which the South Kensington Museum establishment has sustained in the last eight months. The late Captain Fowke had a great affection for him, and when Mr. Sykes was too feeble to ascend the stairs of the great picture galleries of the Exhibition of 1862, now pulled down, he carried him up in his arms to see the decorations for the Guards' ball, which was held in them. Mr. Sykes has left behind many designs for the completion of the decorative details of the South Kensington Museum, which his pupils will be able to work out. He has left a design for a monument to be erected in terra cotta over the grave of Mulready, in Kensal-green; and the numerous readers of the *Cornhill Magazine* may bear Godfrey Sykes in their minds whilst looking at the cover of the *Cornhill Magazine*, which he designed at the suggestion of Thackeray, who thoroughly appreciated his really great genius. On Wednesday, the 7th inst., he was buried in the Brompton Cemetery, the funeral being attended by the members of his family, his master, Mr. Stevens, and two particular pupils, Mr. Gamble and Mr. Townroe, besides about seventy officers, masters, and students, of South Kensington, among whom were Mr. Cole, C.B., Mr. Redgrave, R.A., Col. Scott, R.E., Captains Donnelly and Festing, R.E., Mr. P. C. Owen, Mr. Burchett, Mr. R. Wylde, Mr. Collinson, Mr. Liddell, Mr. Snell, Mr. Blanshard, Mr. Peile, Mr. A. S. Cole, Mr. Wehnert, Mr. Slocombe, Mr. Bowler, Mr. Wallis, Mr. Matchwick, Mr. Denby, Mr. Moody, Mr. Dillon, Mr. Ryan, Mr. Morris, Mr. Douglas, and others.

Publications Issued.

MONOGRAMS ANCIENT AND MODERN, by John Eliot Hodgkin, F.S.A. *(Longmans & Co.)*. This work, which is largely illustrated by chromo-lithography, deals with the history and art treatment of monograms and gives numerous examples, collected and designed by the author. It gives a short *resumé* of the history from the days when the Greek cities struck monograms on their coins, down to the present time. He has endeavoured to show, by the examples of modern monograms, designed by the author for his own friends, that they are more susceptible of artistic treatment than they often receive, and that the most refractory initials may be coaxed by a little skill into friendly accord, and he concludes his preface by making suggestions for the guidance of men who desire to produce such devices. The work is quaintly got up, and the book takes the form of a shield, the letter-press accommodating itself to that form.

Notes.

THE PARIS EXHIBITION AND WORKING MEN.—The following is a translation of a paragraph published in the new French journal, *Le Panthéon de l'Industrie et des Arts*:—"The city of Lyons is at present busying itself with the election of representatives of the working population of that city, who are to be sent to Paris to the Exhibition of 1867. To enable this to be done, a subscription has been opened to cover the travelling and other expenses of living, &c., of the representatives sent. We greatly approve of this step taken by the City of Lyons; it is a good example to other manufacturing districts, which we hope to see imitated. We are convinced beforehand that the representatives, understanding the importance of their duties and honourable mission, will come to the Exhibition to study the useful and serious side of it; and we are sure that they will be but rarely seen in the foolish and enervating places of frivolous amusement where the Parisian *bohême* and *demi-monde* are in the habit of taking their fling day and night."

INCRUSTATION IN STEAM BOILERS.—Mr. J. Riley writes to say that for some months past he has successfully used potatoes to prevent incrustation in boilers. He says:—"Before the steam is up on Monday mornings I place threepennyworth in the boiler, through the safety-valve, and blow some water off on Saturdays, to clear the dirt out, so that the expense is very small. I use the smallest and commonest potatoes, because they are more for the money, and answer the purpose quite as well."

Correspondence.

GAS PIPES IN SUBWAYS.—SIR,—I have read the discussion which recently took place on Mr. Burnell's paper on the gas supply of Paris, and beg to endorse the remarks made by Mr. Godwin in reference to the question of laying gas mains in subways. The subways of Nottingham having been alluded to, I will give you some information as to their construction, extent, and use, and as the corporation of this borough have for some time given considerable attention to the subject, their experience may have some little value. The first subways formed were in Victoria-street and Queen-street, and have an aggregate length of about 560 feet; these new streets were made in the centre of the town, and being the first

of an extensive series of town improvements, the corporation were desirous of introducing the best means of preventing the constant breaking up of the surfaces of the public streets for drainage, gas, water, and other services. The subway is 10 feet wide, and 7 feet high, and was completed three years ago, and therein were laid the sewers and branch drains, and the gas and water mains and services. The subway is well ventilated; no escape of gas or water has, to my knowledge, taken place, though the interior has been constantly visited and worked in by the men employed by the corporation, and the gas and water companies, for branch drains and service pipes. I have never observed a safety lamp used, or heard of its necessity; and I have seen gas service connections made with an open light, even with a gas-light obtained direct from the main, immediately contiguous to the branch in course of being attached. Hitherto the workmen alluded to have had, at all times, free access to the subway. The second subway was made under Lister Gate, the greatest thoroughfare in Nottingham, after the same had been widened and improved at an enormous cost, to meet the increasing traffic. This subway is somewhat similar to the first, but with improved details as to ventilation, access, and internal convenience, and therein the main sewer of that part of the town is built with service connections, and also the telegraph wires are therein fixed. For some reason the gas and water companies have declined to use it, and have instead deliberately ripped up the street with four trenches for two lines (each) of gas and water mains. The corporation are highly annoyed, but, notwithstanding, have decided to construct a similar subway under a third street improvement now in progress. The advantage of subways (if safe for gas pipes) is universally admitted, and their most earnest opponents have failed to show any case against them, for water, telegraph, and similar purposes (*vide* Minutes of the Select Committee, June, 1864), but in respect of gas mains there undoubtedly is possible danger (as in every place to which gas is conducted), unless sufficient means of ventilation are provided, and the best modes employed in making and continuing the joints of mains and service pipes. I entirely believe in the statement of Mr. Hawksley that, in a well managed company, the escape from the mains is very slight indeed (say from 2½ to 5 per cent.); but I venture to contend, that in a well regulated subway, escape from the mains to become dangerous need not take place at all, for the following reasons:—1. That they are not subjected to the perpetual vibration caused by street traffic. (In a subway there is no vibration.) 2. That they are not constantly disturbed by excavations around and under them for services, and for drainage operations. 3. That they are under regular inspection, and the joints can be recaulked when necessary, or bitumenised or varnished from time to time. 4. That oxidation would be less rapid. Furthermore, if an insidious escape of gas happened, an ordinary ventilation would prevent serious consequences. The wrought iron services are the greatest promoters of leakage, and, during a daily experience of underground work for the last 11 years, I have scarcely ever found a perfect service pipe which was not new or nearly so. The lime of the pavement concrete, and the damp of the soil, destroy the pipe, and the traffic loosens the joints. Now, this may be prevented by using lead services, but, in a subway, the destructive influences mentioned would not operate to anything like the same extent with wrought iron, and their renewals would be readily accomplished. It has been stated that, under the present system, escape gas is absorbed by the soil, and that soil forms the best cushion on which to lay the pipes. If this be the opinion of gas companies, the subway plan offers no impediment, as on the side of the subway intended for gas mains the same may be embedded to any required extent; in fact, this is already the case in Covent Garden subway. Leakage by endosmose action has been advanced, but if gas companies prove all their pipes, as they profess to do, the pressure employed in gas mains will be altogether insensible. It is true, if a large pipe be accidentally broken, the same damage might arise as if the casualty occurred in a street or any other place, but if large operations were in progress in the subway, corresponding precaution would (and could most easily) be taken to meet the contingency of accident; and it is only reasonable to expect, that in a large system of subways, the control and management thereof would be in the hands of a single and responsible authority. It is the interest and duty of corporations and other bodies, having the charge of the highways and streets of large towns, to prevent as much as possible their constant disturbance; and if the subways now proposed will effect this object, without detriment to the companies, they ought to be compelled by the legislature to adopt them, and I think it rather exhibits a want of fairness and public spirit for the gas and water companies combinedly to oppose them (the latter company without a shadow of pretence) without giving those trials which the Metropolitan Board and the Nottingham Corporation have so generously and earnestly offered. It should be understood that the so called subways in Paris are simply sewers above the water level, in which the gas and water mains are fixed, and not subways proper as those in England.—I am, &c.,

M. O. TARBOTTON, M. Inst. C. E., Corporation Surveyor.

Nottingham, 20th Feb., 1866.

MR. GRAY'S PAPER ON STEAM-SHIPS.—SIR,—Mr. Gray proposed to deal with the four subjects—Bulkheads; boats; boilers and safety-valves; compasses; anchors and cables. He proposed to inquire how far statutory interference is demanded in the minor details of construction and equipment. As regards the mere question of how ships shall be constructed for simple mercantile transactions, setting aside the plying for hire or carrying passengers, I do not see why the laws should interfere. If, on the risk, as with other transactions, men will be found to enter for the wages offered, then it becomes a simple matter of building and working a vehicle. But who shall determine when that character may cease, and the vessel be employed either for passengers or as a transport for troops homeward? On the railways, in the carriages, and over the bridges which span streams or valleys, justly, I think, the laws look to the security of the public before they permit traffic to pass. Then, if there be a danger to be apprehended on land from the workmanship, as well as the material employed, surely the vessel, the engines, and the vast range of difficulties as to the crew employed, render it a matter of vital importance that the structure should be, as far as human foresight can govern it, perfect *per se*. And, beyond this, there should be a certain legal uniformity by which perfect vessels should have a *quasi* patent of superiority, and only such vessels should be legally authorised to carry passengers, deducting in all such cases a *pro rata* tonnage for each individual embarked. Moreover, in return for the premium paid for such passage, each passenger should, as in the case of the railways, have his right of damages against the owners where any act of negligence can be proved. Before entering further into how the legislature should act, it will be well to consider whether the means adopted as to the sections, longitudinal bulkheads, and other internal fittings of ships are, *bonâ fide*, what they are represented to be. And, perhaps, I may be allowed to speak decidedly on this subject, having, in the year 1818, first urged the compartment and unsinkable system on the Government. Further, as having first carried it out partly in H.M.S. *Ætna*, in 1830; again in H.M.S. *Terror* and *Erebus*, in 1835; and H.M.S. *Assistance* was partly so fitted, but not by me, in 1852. Now, with the exception of H.M.S. *Terror* and *Erebus*, I do not believe that any of them, from difficulties opposed, were honestly fitted with such sealed sectional bulkheads as would, similarly to the *Terror*, have each withstood the pressure of its neighbouring compartment, if partly filled with water in motion. And it is to this point that I think the law should be directed. No vessel should

suffered to sail under false colours, and no vessel ...ely stated to be fitted with sectional bulkheads should ... foisted on ignorant landsmen as a superior vessel. ...ship should be so subdivided into cubical sections, that ... filling of one should not destroy its neighbour— ...d the filling of any, even two, should not endanger ... safety. Next to these transverse bulkheads, I hold ... the very essence of safety consists in the wing ...gitudinal segments, which should in steamers be ...ted to coals, and rising from the flat of the engine-... or floor-heads of wooden vessels to the decks, ...uld become perfect safeguards to any irruption of ...ter in the cases of running down. Further, there ...s space at a short distance from the stern, where, either ...nging on another vessel or receiving a blow, the ...ter should be intercepted, and where no goods or ...tores, particularly coals, as in the *London*, should be ...towed. I believe that all these matters should be effi-...ciently supervised, and the patent of "competency" never ... awarded until very satisfactory scrutiny had taken ...ace. Beyond all these we have to consider the last effort ... save ship and crew—and now that ships have been ...ed with iron decks, I see no difficulty in shutting off ... holds by hermetically sealing certain hatches, and ...ing one of the smallest compartments for the crew. In ...der to understand this perfectly, let us assume that we ... secure the floatation of the ship by a certain cubic ...surement, in which the engines should be included. ...those hatches close from beneath air-tight, then the ...tion of air, by a donkey-engine on deck, would defy ... entry of water. The drawing of the fires would of ... follow the blowing off of some 30 or 40 tons of .... Now let us turn to the boats. This has been one ... hobbies more than half a century.—First, no ship ...ld go to sea with any inferior boat. It is discredit-... to the owner; it is unjust to the crew, who have ...bour more heavily; and it is a loss to the parties, ... they generally have to hire boats abroad. Boats ...ade too heavy, under the false impression that they ... heavy work better, but in reality they destroy .... Next, should iron-boats enter into the num-...required? Or. if they be admitted, let them be fitted ... lifeboats, by cellular divisions, and proved by ... alongside before they are hoisted in. On a ... calculation I should say that these boats would ...ceed a ton in weight, but $2\frac{1}{4}$ tons could be met by ...ful attention to every available air-space. How-..., I would not even then regard this as a true life-...: she would merely be brought into comparison with ...oden boat. The lifeboat should, *de facto*, deserve the ...lation, and be capable of supporting a definite num-... of picked men, fit to manage her, and render aid to ...other boats. Some should certainly be hung to the ... ready for instant service; but a *balsa* lifeboat, ... open bottom, so as to defy any seas which might ... into her, should be supplied by all eminent ship-.... Upon the subject of boilers, safety-valves, &c., ...ould rather not venture to say anything, seeing that ...vers themselves have their own crotchets, and I ...ld be invading their province. As regards the ...passes, I firmly believe in the possibility of meeting ... question of local attraction, for a limited period, ...ent to correct my course, but as such ideas are ...ed with perpetual motion, and squaring the circle, ...all content myself with keeping its solution before ...until I can experiment to satisfy myself, before I in-... my notions on others. The anchors and cables do ... disturb me, as to their manufacture, quality, ...holding powers; but their stowage should meet ... attention of those whose duty it may be to ...rt on the readiness of a ship for sea. In former ...s they were of the first importance to the seaman, ... in allotting lockers for the cables care was ... to afford such a space aft along the deck that they ...d be easily handled. Now machinery supersedes ... capstan, messenger, &c.; and to suit the cargo-...ying ships, any place selected by the owner must be agreed to by the commander. Therefore we find that in some vessels the cables are payed down before the fore-hatchway, and thus with the anchors and the heavy stores of the ship stowed in the forepeak, any introduction of water into the forward sections is certain to materially endanger the ship in smooth water, and must be still more dangerous in a gale. It may be assumed that, as a general rule, private firms have a right to build on whatever lines may be presented to them—as in the case of the cigar vessel. This cannot be denied. But if that vessel was placed to carry passengers between England and her colonies, we fancy the public would be loud in the demand for the interference of Government. So in our own grounds we may construct and use any machines worked by our own people we please, but the moment we come upon the highway we are prevented from endangering the lives of the community, or inviting travellers to risk their lives. There is one point not touched upon in the programme of the matters discussed by Mr. Gray, and that is the modes which should be adopted in saving life—forming rafts, and improvising lifeboats. It would alone form a very interesting discussion. But as that cannot be attempted now, I would observe that I have seen a very important lifeboat constructed for going through a surf by the double set of engine hoses secured round a carvel cutter of 25 feet. To any passenger vessel it might prove of great importance to carry a set of india-rubber tubes of three inches diameter to be used for similar purposes, placed round a boat where the fender is usually secured. The facility with which this arrangement throws off a sea in a deeply laden boat is almost incredible.—I am, &c., EDWARD BELCHER.

DAMP WALLS.—SIR—I beg to state, for the information of Mr. Leopold Paget, that unfortunately the walls of his house have been built with soft bricks; if they had been hard burnt, no damp would have passed through. Bricks are properly burnt when they do not sensibly increase in weight after soaking in water for 24 hours. No paint or composition, not even cement, will adhere to soft bricks; but Mr. Paget may try several washes in very dry weather, of what is called "bright varnish," a cheap material. After twelve months' seasoning, the walls may be painted several coats with any stone colour in oil, which will then adhere. The reason for applying bright varnish in the first place is, that it sinks entirely into the soft material. Tar is often used, but as it does not penetrate, and is slowly soluble in water, it must be repeated once or twice every year, and, moreover, its black colour cannot be concealed or covered by oil paint of any description.—I am, &c., HENRY W. REVELEY.

1, Baker-street, Reading.

MEETINGS FOR THE ENSUING WEEK.

MON......Geographical, $8\frac{1}{2}$. 1. "On the recent Volcanic Eruption in the Harbour of Santorino." 2. Col. Rigby, "On the English Captives in Somali-land." 3. Mr. T. Valentine Robins, "Twelve Months at the confluence of the Niger and Tshadda."
British Architects, 8.

TUES ...Medical and Chirurgical, $8\frac{1}{2}$.
Civil Engineers, 8. Discussion upon "The hydraulic lift graving dock."
Zoological $8\frac{1}{2}$.
Syro-Egyptian, $7\frac{1}{2}$. Mr. J. Winram, "An Analysis of the Chronological List of Manetho."
Photographic, 8.
Ethnological, 8. 1. Sir John Lubbock, Bart., and Mr. Frederick Lubbock, "On the true assignation of the Bronze Weapons, &c." 2. Rev. F. W. Farrar, "On the Adaptation of Races of Man."
Royal Inst., 3. Professor Frankland, "On the non-metallic elements."

WED.....Society of Arts, 8. Mr. A. M. Bell, "On Visible Speech; or, a Universal and Self-interpreting Physiological Alphabet."
Graphic, 8.
Microscopical, 8.
Literary Fund, 2. Annual meeting.

THURS...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8.
Chemical, 8.
Numismatic, 7.
Royal Society Club, 6.
Royal Inst., 3. Professor Frankland, "On the non-metallic elements."
Statistical, 4. Annual Meeting.
FRI ......Philological, 8.
Royal Inst., 8. Mr. Balfour Stewart, F.R.S., "On the evidence of the existence of an Ethereal Medium pervading space."
SAT ......Royal Inst., 3. Rev. G. Henslow, M.A., "On structural and systematic botany."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 28th February*, 1866.

36. Bills—Hop Trade.
38. ,, Rochdale Vicarage.
40. ,, Pensions (as amended in Committee).
15. (91 to 100) Railway and Canal, &c., Bills—Board of Trade Reports.
16. Local Government Act—Return.
28. East India (Cattle Plague)—Report of Commission, &c.
69. Railway and Canal, &c., Bills—First Report.
Prussia—Treaty of Navigation.
Japan—Correspondence, No. 1 (1866).

Session, 1865.

458. Army—Return.

Patents.

From Commissioners of Patents' Journal, March 2nd.

Grants of Provisional Protection.

Artificial coal tars—369—P. A. F. Bobœuf.
Bed bottoms, spring—380—S. J. Salkeld.
Black lead, packing and pressing—470—R. B. Pilliner.
Boot and shoes, stiffenings for the heels of—397—N. H. Felt.
Chilled rolls, casting—463—F. R. Wheeldon.
Cloths, endless—501—J. H. Whitehead.
Coffee, automatic apparatus for roasting—527—A. B. Childs.
Collars, making—474—W. E. Newton.
Cutting presses—328—J. C. Patrick.
Distilling—461—A. C. Kirk.
Dye—525—J. Barry.
Earthenware, preparing clay-dust for making—402—R. W. Armstrong.
Emery, substitute for—389—R. Bond, W. J. Bussell, and B. S. Fisher.
Fabrics, cutting—515—J. Whalley.
Fabrics, making—499—J. H. Whitehead.
Fibrous materials—388—J. Shaw and J. Whitaker.
Fibrous materials, hackling—430—J. Tomlinson.
Fibrous substances, spinning and doubling—448—J. Townsend.
Files—288—J. B. Dalhoff.
Fire-arms, breech-loading—403—F. T. Baker.
Fire-arms, breech-loading—422—J. H. Burton.
Fire-arms, breech-loading—491—W. S. Riley.
Fire-arms, breech-loading, and in cartridges for same—529—W. E. Newton.
Fire-arms, cartridges for breech-loading—443—W. R. Lake.
Fire-escapes—381—J. Sawyer and S. Middleton.
Fish hooks—413—J. Warner.
Furnaces, consumption of smoke in—487—C. Gall.
Gas, heating boilers, &c., by means of—346—T. A. G. Willington.
Glass, furnaces used in making—399—E. Bevan and A. Fleming.
Glazed surfaces, producing—308—G. Greaves.
Grain, sowing—18—H. A. Bonneville.
Grates—445—W. Young.
Guns and rifles, breech-loading, and in cartridges for same—519—J. H. Walsh.
Gun barrels, cleaning—537—H. Bayliss.
Hair cloth—418—J. Ryley.
Hats—395—S. B. Simon.
Hats—428—G. Hart.
Hats, felting the bodies of—455—J. Vero.
Heating apparatus—489—W. Cotter.
Horse nails—426—J. Huggett.
Illusory exhibitions, apparatus used in—442—A. Stoddart.
Jewellery, ornamental surfaces for—505—W. B. Woodbury.
Lamps—366—H. A. Bonneville.
Liquids, pumps for raising and forcing—454—J. B. Fenby.
Machinery, clutch for driving—406—W. Clissold.
Male or female attire, pocket for—513—G. D. Jones.
Manure—191—A. F. Mineur.
Meat for food, preparation of—483—A. H. Hassall.
Metallic chains, ornamental—317—T. Jenks.
Minerals, cutting—477—J. Bethery.
Optical instruments—473—H. E. Newton.
Oxidation, &c., preserving metals from—394—H. E. F. de Bri[illegible].
Paper collars—437—A. V. Newton.
Paper, printing designs on—467—R. Smith.
Paraffin, purifying—471—J. and J. K. Seames.
Pavements—3035—T. Barrens.
Photographic lens—396—J. H. Dallmeyer.
Port stopper—436—A. V. Newton.
Printing machines—393—W. Rock.
Privies and commodes—412—C. E. Giajola.
Pumps—539—H. S. Swift.
Rails, bars, and girders—453—S. W. Kelly.
Railway carriages, communication between guards and passengers in—276—H. Wilde.
Railway trains, securing the safety of persons travelling by—36[illegible]—C. Defries.
Range ovens—427—J. G. Clarke.
Saltpetre and white lead—391—C. Delafield.
Screw propellers—460—H. B. Young.
Sewing machines—495—J. Paterson.
Sewing machines, carriages and castors for—421—W. R. Lake.
Shower baths, raising water in—392—J. G. Avery.
Shuttle tongues—507—S. Nelson.
Silk and satin fabrics, ornamentation of—387—R. E. Higson.
Skins, reducing the thickness of—493—W. E. Gedge.
Slide valves, pistons, and glands—479—T. Adams and G. J. Parson.
Spinning and drawing rollers—498—J. H. Johnson.
Spinning, rings for—407—J. Higgins.
Steam boilers, heating the feed-water for—503—J. H. Whitehead.
Steam, carburetting low pressure superheated—513—J. Kidd.
Steam engine, rotary—384—H. Deymann.
Steam engines—425—B. W. Farey.
Steam vessels, extinguishing fires in—456—J. Ogden and A. Ryan.
Threshing machines—452—W. Brown and C. N. May.
Valves—523—T. Williamson and E. P. Marren.
Vehicles—370—E. Price.
Vehicles, wheels for—409—G. F. Russell.
Vessels, stopping leaks in—439—F. P. Warren.
Water and other taps—462—S. Mason.
Watercourses, &c., cutting—286—J. Robertson.
Water, raising or forcing—385—J. B. Atwater.
Weaving, jacquard wires used in looms for—417—J. and W. Binns.
Weaving, looms for—401—J. Walker.
Weaving, looms for—466—J. Holding and P. Todd.
Weaving, looms for—509—H. Lea.
Weighing apparatus—543—N. R. Hall.
Wire and wire rods, rolling—485—G. Bedson.
Wood, combining surfaces of—451—S. Drake.
Wool, combing—450—T. Whitley.
Woollen damasks—415—E. Seyd.
Woven fabrics, cutting the pile of—446—J. Patterson.

Inventions with Complete Specifications Filed.

Drills—535—W. R. Lake.
Iron and steel—554—C. J. Cammon.
Skates—573—J. L. Barber.
Steam boilers—533—W. E. Gedge.

Patents Sealed.

2275. J. Snider, jun.	2318. A. E. Nordenskiold and J. W. Smitt.
2277. J. Grand.	2319. J. Pennington.
2281. W. Bunger.	2329. C. J. Webb.
2283. L. Gachin.	2330. D. Keys.
2291. E. and E. Green, jun.	2333. G. Tangye and J. Jeffery.
2299. A. Morel.	2336. T. D. Stetson.
2301. J. Askew.	2370. H. A. Bonneville.
2310. J. Brigham & R. Bickerton.	2756. T. R. Crampton.
2316. R. P. Roberts.	

From Commissioners of Patents' Journal, March 6th.

Patents Sealed.

2305. J. Webster.	2387. E. Clark.
2309. J. Anderson.	2397. D. J. Fleetwood.
2313. J. Hoss.	2456. N. Korshunoff.
2320. S. Davis.	2495. S. Dunn.
2322. W. Hewitt.	2504. G. Davies.
2327. J. Lightfoot.	2537. W. E. Newton.
2342. J. Dodd.	2650. W. E. Newton.
2357. L. G. Sourzac & L. Bombail.	2661. H. E. Newton.
2371. J. H. Johnson.	3358. A. V. Newton.
2373. F. Carlier.	3383. W. E. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

535. H. Edmonds.	602. C. M. Palmer & J. McIntyre.
567. J. Maxfield.	584. C. Garton.
570. E. Paine.	594. G. Price and W. Dawes.
574. E. Hayes.	598. D. B. Parsons.
585. J. S. Wells.	629. J. Elsey.
599. B. S. Cohen.	587. T. E. Symonds.
654. A. Keller.	632. W. H. Buckland.
730. S. L. Crocker.	694. J. Tangye.
571. T. E. Symonds.	

Patent on which the Stamp Duty of £100 has been Paid.

5[illegible]. D. [illegible].

Journal of the Society of Arts.

FRIDAY, MARCH 16, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'clock:—

MARCH 21.—"On Deer Forests and Highland Agriculture in relation to the Supply of Meat." By Professor LEONE LEVI.

MARCH 25.—*Passion Week.*—NO MEETING.

CANTOR LECTURES.

A Course of Lectures by Dr. F. Crace Calvert, F.R.S., will commence in April. Particulars will be duly announced.

NATIONAL PORTRAIT EXHIBITION, 1866.

Season Tickets for this Exhibition are now ready, and may be had at the Society of Arts, on application to the Financial Officer, price £1.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The Committee met on Wednesday, January 24th, 1866; present, Henry Cole, Esq., C.B., Sir John E. Harington, Bart., Colonel Scott, R.E., and Edgar A. Bowring, Esq., C.B.

Dr. STERNDALE BENNETT, Professor of Music in the University of Cambridge, examined by the Committee.

680. You are a director of the Philharmonic Concerts?—Conductor.

681. How long have you been so?—Ten years.

682. And before that time you received your musical education in the Royal Academy of Music?—Long before that time.

683. For how long were you at the Academy?—About ten years. I should add that I was scarcely ten years of age when I first went to the Academy.

684. Do you recollect the precise period during which you were at the Academy?—From 1826 to 1836.

684*a*. Living in the house?—Yes; during the whole ten years.

685. Besides being a student in the Academy, were you subsequently a professor there?—Yes.

686. Was not ten years an unusually long time for a pupil to remain at the Academy?—Yes, it was; very few remained so long, though some remained eight or nine years.

687. Were there special circumstances which induced you to make so long a stay?—I had no wish to leave, and they kindly kept me there.

688. At your own expense, or that of the Academy?—At the expense of the Academy entirely.

689. In respect both of living and tuition?—In both respects.

690. Are you acquainted with the present state of the Academy?—I have ceased for some years to take any active part in the institution.

691. Are you aware whether any or many changes have taken place since you were there?—When I left the Academy as a professor there was, I believe, a board of professors, but it did not keep together very long. After the death of Lord Westmoreland, it was reconstructed by the new principal, Mr. Lucas, but whether it now exists in any shape whatever I cannot say.

692. During your time at the Academy as a student there was a board of professors?—The board of professors was instituted many years after I left the Academy as a student. I was a member of the first board, and I believe I was the first to leave it.

693. During the time you were there as a student what was the management, broadly speaking?—There was a superintendent (a clergyman) resident in the house, and the committee were very active at that time, and performed their duties very well as far as I could understand.

694. That committee being composed of laymen?—There were no professional men on the committee.

695. With respect to the board of professors of which you have spoken, what were the relations between them and the committee of management?—The committee left with the board of professors the arrangement of the classes and the examination of the pupils, and the Board of professors gave general advice upon musical matters.

696. Are you of opinion that the introduction of that board of professors was an improvement upon the state of management when you were there as a student?—Very great.

697. You think it did something that was wanting?—It was a link between the committee and the large body of professors.

698. With that board of professors there was a principal as well?—Yes.

699. Who had more power than any one member o the board?—Not exactly that; he would take the chai at the meetings of the board.

700. Had he a second vote?—I do not recollect as to that.

701. Would it have been his duty, in the event of the absence of a professor unaccounted for, to call him to account?—That would have been done through the board of professors, I apprehend, as long as it existed.

702. How often did the board meet?—Once a week.

703. And they went into the question of the attendances of the professors themselves?—I should say that any formal complaint on the part of a pupil, or parent of a pupil, of inattention or absence of a professor, would have been brought before this board.

704. And then reported to the committee of management?—If necessary.

705. Do you happen to recollect what led to the abolition of this board of professors?—I do not. I was the first to leave it because I felt, having given over certain powers and duties to the board of professors, the committee of management sought very much to limit and control those powers. I left the board a good deal on that account. I thought there was so much good in the board of professors, that when I saw that what was suggested by them was not carried out I withdrew, as I considered I was wasting my time.

706. Since the power has been resumed by the committee of management is it your opinion that the Academy has become improved or otherwise?—I cannot give an opinion.

707. Is it your opinion that the present state of the Academy is as satisfactory as it was during the ten years you were there?—There should be more exhibition of musical talent, I think.

708. Broadly speaking, do you consider the Academy to be in a satisfactory position at the present time?—No; I do not.

709. Did you assist as a teacher in the Academy after you left the board of professors?—I believe I did for a

short time. I have since been more than once invited to rejoin the Academy, but could never see my way clear to doing so.

710. Did the board of professors come into relation in any way with the committee of management?—Yes, they did. The minutes of what was done by the board of professors would be laid before the committee.

711. Of which Lord Westmoreland was the chairman?—Yes; his lordship, I should say, took the most active share in the management.

712. Had the committee power to overrule the decisions of the board of professors?—Yes.

713. On professional points?—On all points.

714. The committee, though not themselves professors of music, had it in their power, and might, and perhaps did, overrule the professional judgment of the board of professors?—I am quite distinct upon that.

715. Since your time have the fees for pupils in the Academy been raised?—They were raised, I fancy, about three guineas.

716. You are aware that the fees at present are thirty-three guineas a year, or for the three terms?—Yes. Formerly, I think, the indoor pupils paid £50 a year, and the outdoor ones £30. It was found that there were not sufficient indoor pupils to pay the expense of an establishment with proper officers and servants. I, for one, advised that the boarding of the house should be given up, but to this day I very much regret that it was obliged to be done. Owing to the loss it occasioned them when they came to have outdoor students only, I think the three guineas were added to the fee; and it was then I believe that the division of the year into terms was established for the first time.

717. Will you give the committee your opinion as to the propriety of boarding and lodging the students in the Academy?—Well, I think there was much more real work done when the students were in the house. I have reflected much upon the point of the residence of students. I think it worthy of the deepest consideration. It is within my knowledge that many students have left the Academy on account of the time that is lost in going to and fro. Worse still, they arrive in a flurried and excited state from passing through the streets of London, and anxiety to be punctual, and are comparatively unfit to take advantage of their lessons, and by the time they get home again they are equally unfit for practice.

718. Do you not think by proper arrangement and organization that loss of time as well as physical inconvenience which you speak of might be reduced to a very considerable extent?—Yes. I believe the present Academy has done much in this direction, but it is a sword that cuts two ways. You can arrange for pupils to receive their two or three lessons on the same day; but is this a good plan? It seems to me a very fatal practice, especially as regards lessons in composition. The pupil ought to have time to go and reflect on what the master has told him during his lesson, and it ought not to be driven out of his head by lessons on the violin or some other instrument immediately after.

719. What led to the giving up of the lodging and maintenance in the house?—They simply could not afford to do it. They had so few pupils in the house it did not pay.

720. So few paid the fees for board and lodging?—Yes.

721. Is not that to your mind some proof that the parents of students find it more economical to take on themselves the charge of board and lodging rather than pay the institution for it?—The Academy found they could not afford to do it in the way of board and lodging pupils.

722. Notwithstanding they were doing it at a loss, still the students could not afford to pay the charge. Do you think there were other causes which prevented students coming in sufficient numbers to pay for the board and lodging? and is it to be inferred from your previous answer that the more boarding students they had the more the loss to the academy was?—Not altogether so; they had not sufficient students indoors to pay for a household; if they had had more it would have paid them better up to a certain point.

723. To what causes do you attribute the decline in the number of students coming to the Academy which led to the loss?—I could never find that out.

724. Are you aware that at the Paris Conservatoire there are between 600 and 700 students, very few of whom are boarded in the house?—I did not know that; nevertheless, I think if the Academy were in London, or near it, great stress should be put upon requiring the pupils to reside in the house.

725. Do you not think that could be met by arrangements which would enable the students to arrive at the Academy at an early hour in the morning and leave at a late hour, and by providing means for taking their meals in the house without sleeping there?—That would be better, no doubt.

[The Chairman explained the system in this respect which is adopted in the Art Training Schools at South Kensington.]

726. Would some such arrangement as that meet your views as regards the avoidance of excitement and physical fatigue?—Yes, it might; and if you could go further and allow a proper interval between the lessons it would be of great importance.

727. You are aware that of late Parliament, in its benevolence to music, has given a grant from the funds of the state of £500 a-year?—Yes.

728. Do you approve of that?—I should like to see it a great deal more.

729. Is it your opinion that a lay superintendent—lay *qua* music—was of much importance in your time?—He, of course, took entire charge of the conduct of the students, and the management of the institution generally.

730. At the Paris and most other foreign Academies, there is an officer who is styled the director, who is a professional man. There is M. Fétis at Brussels, Auber at Paris, and other men of that class elsewhere. It is that class of men who you think ought to be charged with the whole direction of the business of the Academy?—It would not, in my opinion, be strictly necessary to have any one so eminent as M. Auber in the position of director or keeper, but any person in this position must at least have the confidence of the public, and be a thorough musician—able to enforce the musical discipline, and perform general musical duties.

731. We have had two sets of opinions given to the committee on what may be termed the professional direction of the Academy. One opinion is that the director shall be a professional man of great common sense, and at the same time of the highest professional ability that could be acquired. The other opinion rather points to the oligarchical management of a board of professors: have you made up your mind to which system you would give the preference?—I think there should, in the first instance, be a committee of management, consisting of non-professional gentlemen, who would take charge of the institution generally, and attend to all financial matters. These duties could never be properly done by purely professional people. After this committee should come a board of professors, who would preside over all matters strictly musical; and with this board there should be connected a resident principal or keeper. Of course the principal and board of professors must, in some respects, be subordinate to the committee of management.

732. Subordinate in the question of expenditure, but not in the management of the pupils, as respects the instruction?—Exactly.

733. Would you wish to have a superintendent of studies, as they have abroad, besides what is called now the principal?—The offices might be vested in one and the same person.

734. The practical question is, whether the manage-

ment of the Academy, so far as the instruction and the daily conduct of the school is concerned, should be in the hands of one individual or entrusted to a board of some number; which of the two plans would you recommend?—My idea was to have both. I did not mean to give this director absolute power. I think in the absence of the board of professors there should be a musician fixed there.

735. Who is to see that the professors and students do their duty?—This very person I speak of. He should always be on the spot when any music is going on.

736. Is it not the case that since you were at the Academy the premises have become very much deteriorated?—Very much so. They were repaired some years ago, but the play-ground has been entirely taken away. It was formerly really a very pretty place.

737. Do you know that the Royal Academy have received notice to leave the present premises?—I only read it last night.

738. Assuming that to be the case, have you any suggestion to offer to the committee as to what should be done in this dilemma?—I have often wished we could have an institution a little way out of London. My own idea is that London is not the proper place for it.

739. What are your reasons?—From the excitement of the place and the long distances, and looking to the greater ease with which the thing could be carried out.

740. The greater elbow-room?—And the less cost.

741. Do you think the advent of railways in London would make it easier?—Certainly.

742. Are you aware that the Royal Academy made an application to the Royal Commissioners of the Exhibition of 1851 to give them a site at Kensington?—I heard of that.

743. Should you think that a good site?—I should think it one of the best in London, but I should like to take them out of London.

744. That would involve the other part of your scheme of living in the house?—Yes.

745. If out of London, how would you arrange about the professors?—I do not conceive much difficulty about that. You will find upon enquiry that a great many eminent professors attend, for extra studies, the public schools, such as Eton, Rugby, Wellington College, &c. Make fewer professors and give them more work, and they will follow you anywhere. Brighton is visited daily by eminent London masters. I myself spent a whole day professionally once a week at Brighton for nine years.

746. Are you aware of the very great number of professors at present attached to the Royal Academy of Music?—Yes: I have seen the list. I think that has been a great mistake.

747. You are of opinion that fewer active professors, attending well to their duties, are better than a great many who do not attend?—Far better.

748. Are you aware from what circumstance this large number of professors has arisen?—No doubt it is thought an advantage to be upon the list.

749. Not to the Academy?—No; certainly not, to have so many.

750. Mr. George Macfarren suggested the advantages which would arise from the practice of church choral music, and also suggested the desirability of having a chapel attached to the Academy as affording a favourable opportunity once a week of giving good choral music. Does that suggestion strike you as being of value?—Anything which tends to the cultivation of Church music must be desirable in an institution of that kind. I cannot pretend at present to say how it could be carried out.

751. You would be in favour of having a proper concert room?—By all means.

752. And a small theatre?—If possible. At Leipsic they have a very nice concert-room for the students: a performance by the students in their concert-room was arranged purposely for me last January twelvemonth.

753. Have you had an opportunity of reading the evidence which has already been given before this committee?—I have read Mr. Chorley's and Mr. Macfarren's evidence.

754. Have you any observations to favour the Committee with upon the evidence you have read?—No; but I am anxious to recur to my opinion upon the point of the pupils living in the house, and in that case I should take them a little way out of London.

755. Supposing it should be impracticable to raise a scheme for their residence in the house, you would be content with the best arrangements that could be made to afford them the utmost personal comfort during the day?—Yes; at any rate to give them more time at the Academy than they have now.

756. To keep them at the Academy the best part of the day?—Just so.

757. As any kind of Royal Academy would, in some measure, have to depend either upon the liberal assistance of Parliament, or the good-will of the public, besides the receipt of fees from the students, do you not think that an institution within the suburbs of London would be likely to excite more public interest than one removed far distant from the metropolis? Do you think that any concerts given by the Academy, as showing the progress of the pupils, would be so largely attended if they took place twenty miles away?—I do not know about that. There is the Crystal Palace. The public go to concerts there in great numbers; and it is the same on speech day at Eton, Harrow, Rugby, Wellington College, and many other places.

758. It is to be inferred from the views you have expressed that you desire to see the Royal Academy an effective and hard-working institution?—Yes.

759. And as a means to that you think residence in the house would afford great facilities?—Yes; and I am not anxious for a large number of students at a time, nor to give the Academy a popular tone.

760. What should you consider a large number of students?—That I have not thought of. I should think 40 or 50 young persons at once, but all intended by nature to become musicians.

761. You would not limit it to male students?—I see the difficulty of providing residence for female students.

[The CHAIRMAN explained that out of the 600 students in the Art Schools 350 were female and only 250 males.]

762. Do you not think there would be dissatisfaction on the part of the public if the Academy were not freely opened to both classes?—Oh, yes; I see that.

763. Do you desire to see a good musical library?—Very much.

764. And perhaps a museum of musical instruments?—Also.

765. You would desire, if possible, that the institution at the Academy should be throughly complete in all its branches, and with all instruments?—By all means.

766. Should you prefer to see the present Royal Academy of Music improved or extinguished by a new institution?—I should for many reasons desire to see the present Academy improved. I should say an institution, whatever may be its present state, cannot have existed for 40 years without having established some ground.

767. There would be some advantages from its age and experience?—There must exist throughout England the traditions of good teaching. When I was a student at the Academy, I remember among the eminent people, J. B. Cramer, Moscheles, Spagnoletti, Kiesewetter, Lindley, Crotch, Attwood, Goss, Crivelli, Mrs. Anderson, Potter, all in active work as professors in the institution. The influence of such teachers cannot easily be lost. There are a great many old students of the Academy both in London and the provinces who are never before the public, but who are doing their work thoroughly well, and these are much more likely to prepare pupils for their old Academy than for a new one.

768. You do not sympathise with the opinions expressed as to the expediency of abolishing the present

Academy and starting *de novo*?—I would rather see the existing Academy improved.

769. You think it capable of improvement?—Quite so.

770. Beyond what you have stated, is there any other point respecting its improvement you would wish to lay before the Committee?—I agree with those who have spoken of the orchestra. It has gone down for some years. When I was a boy I could take down a MS. concerto, and play it with a complete orchestra, always to hand.

771. Do you consider the Royal Academy might have useful relations with the various local institutions that promote music throughout the provinces, either in the way of receiving pupils from them, or in conducting local examinations?—Yes. I think so.

772. You think it might fairly be in a position to be the head-quarters of the music of the country?—It should be.

773. And in friendly relation with everybody?—Yes.

774. Are you aware whether the Royal Academy has ever studied military music?—I know some of the band-masters were educated at the Academy and have become good musicians; but educating a bandmaster and educating a band are very different things. If I had to make up an orchestra for the Royal Academy, rather than take the responsibility of educating military bands, I would employ the band masters to do it. I do not see that it would be an improvement for the Academy to undertake the education of military bands.

775. Are you aware of a plan which has been adopted by the Marquis of Salisbury of apprenticing lads to the master of the band, and keeping them for a number of years, by which means the Hertford Military band is one of the best in the country?—I was not aware of it, but am very glad to hear it.

776. You approve of that system?—Yes, very much so.

777. It is understood that some of the best performers in the Guards' band have been obtained through the sort of military musical school which the Marquis of Salisbury has been the means of promoting?—I am very glad to hear anything of that kind.

778. Do you think the present fees of the Royal Academy are too high or not?—By no means. I think, if anything, they are too low.

779. You think 33 guineas a year too low?—I should say the fees are not high enough, as payment for three or four separate branches of study.

780. Do you consider there should be free scholarships as at the universities?—Yes; I should like to see as many free scholarships as possible. I took great personal trouble in establishing the Westmoreland Scholarship.

781. Are you aware that there is now great complaints against the fees being too high, and that there is difficulty in getting pupils to pay those fees?—I think the complaint is unjust. The institution could not have existed up to this time if more than nominal fees had been paid to the professors.

782. Assuming for the instant from some outside source, not the fees of the students, that a revenue could be obtained sufficient to maintain, say 40 students with gratuitous education, should you think it desirable to establish fees so high as at present, it not being necessary for the adequate payment of the professors?—I should take care that the terms were pretty high, because you must stop ignorant people from coming in.

783. You would exact the test of competency, even though a high fee were demanded?—Yes.

785. But assuming a very competent person applied for admission, and assuming the number of free students to be full, should you feel disposed to take that student at a high or a low fee?—I should be sorry if a place could not be found for such a student; but a line must be drawn.

785. Your effective scholarship being filled, and there being room in the Academy to take in a very competent person, would you think it right that such a person should be debarred from entering the Academy by the imposition of a high fee?—If the free scholarships were filled up it would be a piece of misfortune for the candidate.

786. You would impart some test before any student was admitted either at a high or a low fee?—Most certainly. That is the greatest security we can have.

787. You think it essential, for the well-being of the Academy, that it should not be dependent upon high-paying students, but that it should be adequately endowed?—In the first instance it should be, no doubt. The Academy for the last few years may be said to have been living from hand to mouth. In its present state the fees of the students are not sufficient to carry out the institution with anything like efficiency. If it had not been for the liberality of the professors, I think it must have been closed some years since.

788. High fees are avoided on the Continent?—The Academies are endowed by the state.

789. On the assumption that the Academy is put on this amended footing which you think desirable, do you consider it of importance that a theatre should be attached to it?—I should think it of great advantage.

790. With dresses and scenery to a limited extent?—It would be an advantage, no doubt, to pupils training for the stage. The present Academy had public performances of Italian operas some years since, and on one occasion I played Cherubino in "Le Nozze di Figaro."

791. Do you think students, while students, should be encouraged in public performance, or do you think the audience should be limited to the friends of the institution and the pupils?—I am not in favour of students being too early accustomed to public performances. That is all included in part of my scheme for taking the Academy out of London itself. I do not like to see them too soon in the concert-room.

792. You would perhaps go as far as to prohibit students from performing in public for remuneration till they quitted the Academy?—In nine cases out of ten they appear much too soon.

Mr. Ernest Pauer examined by the Committee:—

794. You have been many years in this country?—Fourteen.

795. For how long have you been a professor at the Royal Academy of Music?—I have been so for six years.

796. The instrument you teach is the pianoforte?—Yes.

797. How many pupils have you in the Academy?—When I began I had nine. In the third year I had five, and for the last two or three years I have had only one.

798. Notwithstanding which your private practice may have increased rather than diminished?—Yes.

799. You do not attribute the decrease of your Academy pupils to the increase of your private pupils?—I could not say so.

800. The public have appreciated your instruction, but for some reasons the pupils of the Academy have not increased in number?—They have not. I had the highest terms the Academy could afford to pay; but even at those terms it was for me a great sacrifice. I was, therefore, not over anxious to get pupils at the Academy.

801. As, even at the most flourishing period of your teaching, the number of pupils did not appear to be very great, do you conceive there was any good reason for having two or three other professors of the pianoforte besides yourself?—I consider there are just two-thirds too many professors in the Royal Academy at the present time.

802. You do not consider that the professors are proportioned to the demands of the students, but quite independently of that demand?—Decidedly. The title of professor of the Royal Academy may be considered, perhaps, as carrying some *éclât*, and it might be very nice to print it on a visiting card.

803. In point of fact it would seem that the tendency is rather to create professors than students?—I could almost have undertaken the whole of the pianoforte pupils, with the co-operation of M. Goldschmidt and another professor.

804. Do you think it is generally regarded as a distinction to be a professor of the Royal Academy of Music?—At first I considered it so, when it was offered to me, and I tried to do justice to it.

805. It has been the practice to allow the old pupils to teach in the Academy as much as possible, has it not?—Yes.

806. For the satisfaction of the teacher rather than that of the student?—One might suppose so. It was a kind of protection which it gave to the name. They are called sub-professors. I think this arose from the fact that the attendance of pupils was so small, and the sub-professors were obliged for some time to teach gratuitously.

807. You mentioned just now that professors liked to put that title upon their cards; from that it is to be presumed that the professors regard the Academy as having established a certain position as an Academy of Music, and that it is considered by them a mark of distinction to be professionally connected with it?—Yes; it ought to be so, certainly. Every man would be proud of it if the Academy were what it might be.

808. How many pupils are there at the Academy at the present time learning the pianoforte?—I think there are about 28 or 30.

809. And how many professors and sub-professors are there?—Counting all upon the list, between nineteen and twenty-one. I quote from memory.

810. That would not be quite a pupil and a half to each professor?—About that. I may presume the number has been increased of late, because two of my pupils have been appointed professors.

811. Do you not think that is a system which is calculated to divest any competent professor of all proper interest in his work?—Decidedly; it takes away a great part of the interest.

812. You would think it necessary, in reforming the Academy, that the principle should be to apportion the teaching to the demand for it, so that each professor should receive the payment that is right and sufficient, and that no more professors should be appointed than are absolutely necessary?—If you will allow me to state, I have thought often and deeply about it. My experience in observing other Academies has shown me that the best plan is, for such a leading instrument as the pianoforte or the violin, that there should be one principal professor, who should be held responsible for all the teaching of that particular instrument. He should also be responsible to the director, who never ought to teach. As Professor Sterndale Bennett says, "he ought to be at the Academy as much as possible," to be in the house to see that the professors and pupils generally do their duty. As all the examinations are made publicly, it will be seen by the examinations whether he has devoted his attention and trouble to his class or not.

813. And all the other teachers should be under the authority of the head of each department?—Yes. After so many years' experience as we have had we may come to the conclusion that there is a certain system of music which should be taught. If there are too many teachers and too many different systems, you bring about confusion. I have made the observation in the Academy that the simplest technical objects have been unknown to the pupils. Some of them could not play minor scales in thirds or major scales in tenths. In fact, the elementary ground work has been greatly overlooked.

814. Are there at present any professors without pupils?—I have only just arrived from abroad; and as I had last year only one pupil, I might this year be without one at all.

815. Can you favour the committee with any practical suggestions for the better organization of the Academy, and what you would wish to see carried out there?—First of all I would ask for a grant of £10,000 from Parliament; then to have one responsible director who should be wholly independent, and whose salary would place him in such a position that he need not undertake any other office which might encroach upon his time.

816. He should devote the whole of his time to the business of the Academy?—Most decidedly. He would gain a social position which has hitherto been quite unknown amongst us musical people in this country. Then there should be for singing, composition, the pianoforte, the violin, the organ, and perhaps for other most important instruments, a staff of the most competent professors, who would be head masters of their classes and responsible for the teaching.

817. Do you mean one head professor for each instrument?—Most decidedly, for each principal instrument; also for singing and composition. The examinations would show whether the first professor was competent or not. There should also be a vice-director, to carry on the functions in the event of the director himself being unable to do so from illness. This post could be supplied by one of the head masters, provided he were elected annually.

818. Such an organization as you have sketched implies that a great number of the present professors and others now connected with the Academy would be dispensed with?—Decidedly; but there would be no loss by that. Without wishing to say anything derogatory to anyone, I think there are a great number of very moderate teachers at the Academy.

819. The pupils you have taught have been successful in the competitions?—Most successful.

820. And notwithstanding that they have got down to zero in number?—Yes; but I do not mean to say there was any ill-feeling against me. I do not know how the circumstance arose, myself. I have always been on the best terms with every one in the Academy.

821. You spoke of the position of the director or principal. Do you happen to know what salary is paid to the principal of the Academy in Paris?—I am not aware of that, but I should not think the sum is a very high one.

822. Should you suppose it would be £800 a-year?—I could not tell. It is very different abroad: Auber makes a large income every year by the *tantième* of his operas.

824. What should you think ought to be about the sum in England?—A man of position, with the style of living in this country, I should say would not accept such a post under £1,000 a-year. Going on to the remuneration of the professors, I think the most eminent talent could be secured for the Academy on proper economical terms, provided a sufficient amount of work during the year were secured to each professor, and if the engagement were a permanent one.

The Chairman explained that in the Art Training Schools the practice had obtained for many years with considerable success of giving to each permanent teacher a graduated amount, made up partly by a fixed salary, and partly by a share in the fees of the pupils. The result of that system in the case of the principal had been that his income had been increased nearly threefold; and the whole of the professors and teachers were entirely contented with the arrangement.

825. (To the witness.) Do you think some such plan as that would be applicable to the Royal Academy of Music?—Yes; I think it would work quite as well.

826. You have had experience of several of the foreign academies?—Yes.

827. Which do you consider to afford the best models?—Leipsic and Stuttgart are very good academies. At the latter the pupils pay an amount equal to £8 10s. per annum only.

828. Have those institutions any public grants of money?—At Leipsic I think there is a grant from the town, at Stuttgart from the King.

829. What would be about the average number of pupils at Stuttgart?—I should think about 130.

830. All paying this £8 10s. a year each?—Yes.

831. Are there any free exhibitions?—No; that is a price which all can pay.

832. Is the course of instruction complete?—It teaches everything, and they turn out very good pupils.

833. Are you aware how many pupils there are on an average at Leipsic?—The exact number I could not state, but they are always very full. There were last week as many as 15 to 20 students who spoke the English language, but these might include some from America.

834. In mentioning the fees paid by the students of £8 10s. a year, it may be inferred that the fees paid to the masters are very much less than would be given in England?—Yes, of course. In Vienna the largest amount paid to a master is 6s. per lesson; many professors have only 4s. In the central parts of Germany the payment is one florin per lesson only; exceptionally one thaler (3s.).

835. For a competent teacher?—Yes.

836. In point of fact, looking at the difference of prices in the two countries, the £8 10s. paid at Stuttgart would be represented by many times that amount in this country?—It would be so, no doubt.

837. You have heard the evidence which has been given to-day by Professor Bennett?—Yes, I have.

838. Do you concur generally in the opinions he has expressed?—Yes, very much so. I admired sincerely the way in which he spoke of the Academy and the difficulties which I conceive to exist there.

839. Have you any strong opinion with regard to the pupils living in the Academy?—I think I approve of the plan which the Chairman of the Committee has put forth rather than that of Dr. Bennett. If it could be managed, it would be very desirable that the pupils should remain in the Academy during the whole day, but I think there would be very great difficulties in the way of living in the house entirely.

840. You are aware that the Royal Academy is about to quit its present premises?—I heard of it.

841. And also that it has been proposed to build new premises?—I have heard so.

842. The building of new premises will necessarily occupy a long time; should you think it most expedient to try and get temporary accommodation of a humble character, or to suspend the instruction of the Academy till the new premises were provided?—According to my own opinion, it ought to be carried on by all means, even with discomforts in the accommodation; because the suspension of it might tend to let it fall into comparative oblivion.

843. You would prefer accommodation of the humblest character to entire suspension of the operations of the Academy?—Decidedly.

844. You would prefer to continue the present management of the Academy, bad as it is universally acknowledged to be, sooner than, for a certain definite time, give up the Academy altogether?—Yes; because you might introduce some improvements which might work well.

845. You think the seeds of better management might be cultivated?—Most decidedly.

846. As the Academy in Hanover-square will be virtually broken up at Midsummer next, it may be necessary to give notice to everybody connected with it that their services will be no longer required. Should you consider such a course prejudicial or otherwise to future arrangements?—I should not consider it very prejudicial, because you would be certain to retain the most efficient persons.

847. But whether the Academy be temporarily located in humble quarters or not, you would use that opportunity for a complete change of system if possible?—Yes, decidedly.

848. And you would put the management into the hands of one competent person, he having the power to engage the necessary assistance for carrying on the work of the Academy in its transitional state?—No doubt there must be a kind of despotism during that state; otherwise the thing would vanish.

849. Do you think that a director, with ample powers, or a board of professors would be the best as an organ of management?—I would have a director, solely responsible. I think the less you have to do with committees of management the better.

850. As far as you had opportunity of observing the working of the board of professors, you think its action was not beneficial?—I do not think to the extent one might have expected.

851. Your opinion is that if the public want good music the providing of it ought to be assisted to a considerable extent by the funds of the state?—Decidedly; at least for some time.

852. And you cannot expect the musical talent of the country to be properly trained unless the public are content, in some form or other, to pay for it?—Just so; but I think once an Academy of Music was working well, there would not be for a long time much need for Government support, because the generosity of the great public is such in this country that I think ample funds would be provided; but the surest way would be to secure an adequate Government grant, if possible. It, might, however be the case that, if liberal public support were given to the Academy, the Government might withhold its grant.

853. The plan of appealing to the benevolence of the public has been already tried for several years with respect to the Royal Academy. At the present time the funds required are nearly exhausted. Do you thing an institution of this kind ought to be dependent upon such accidents, or do you thing it would be better to have a proper public subsidy, with a proper Parliamentary responsibility for seeing that the thing was well and properly carried out?—That is the only plan you could depend upon for the success of the institution, because the Government subsidy would in itself tend to raise the character of the institution and give it a higher standing, and it would give to those officially connected with it a higher social status than musicians generally have hitherto enjoyed in this country.

854. You think it of advantage that musicians should have that recognition?—Decidedly. It would tend to raise the standard of the musical artist.

855. And you think in a parliamentary supervision you have the best security for the proper conduct of the institution?—There are now so many musical Members of Parliament that I think they would take interest in it. On the subject of the general management of the Academy, Mr. Pauer remarked, that in his opinion the best professors, English and foreign, should be engaged for the teaching. The director of the Academy should, if possible, be an Englishman, but some of the head professors might be foreigners. There are distinguished foreigners in this country who are exceedingly clever men,—such as M. Panizzi, late of the British Museum, M. Costa, and others, who understand the feelings both of Englishmen and foreigners. It is quite a wrong notion to say that foreigners, as a rule, are more musical than the English people. That was a very fallacious idea. He had been fourteen years in this country, and he had had during that time pupils who had shown as much musical talent and taste as any he had met with abroad; and the delight which the English people take in music, and which they show in the pecuniary support of societies, is almost greater than is the case on the continent of Europe. He did not speak of London alone in this respect, but throughout the entire country; and the same remark partly applied to Scotland and Ireland. It was especially the case in the great provincial towns of Liverpool, Manchester, Bradford, &c., and also in Dublin. The funds the Philharmonic Societies of London, Liverpool, and Manchester enjoy are unknown abroad. This was, therefore, the proper time to give the English musician weight and position.

He had no position now. Having been invested by his Sovereign with the order of Francis Joseph he was privileged to attend the Court at Vienna, but in England the musician generally enjoyed no social distinction.

(By the Committee.) If free to have your own way, would you take the Royal Academy of Music as the basis of a new and improved institution, or would you attempt to create a new one in opposition to it?—I would not accept the Academy as a model for the institution, but would try and retain everything which is good and has worked well, but I would not be too delicate in reconstructing the institution after the model of the old one.

856. You have no objection to the present name?—Not at all, as I think it the only good one.

857. And would you keep what funds they have?—I believe they have not very large funds.

The following are the replies of Mr. A. F. Godfrey, bandmaster of the Coldstream Guards, to some of the questions issued by the Committee:—

Q.—3. What is your opinion as to the expediency or otherwise of taking the present Royal Academy of Music as the basis of any enlarged institution in this country?

A.—Although it is my opinion that material improvements might be made in the administration of the Royal Academy of Music, yet I consider that the basis of that institution is superior to that of any other in this country.

Q.—4. What improvements might be effected in the Royal Academy of Music?

A.—Arrangements might be made for giving greater publicity to the compositions of students; and much more frequent choral practice would, in my opinion, be conducive of very beneficial results. These choral exercises have been attended with great success in some of the foreign Conservatoires.

Q.—5. Is any union between the Royal Academy and similar schools, cathedral choirs, or local institutions desirable or otherwise?

A.—The constitution of most of the local institutions is, I believe, so similar to that of the Royal Academy of Music, that I do not know of any particular benefits which would arise from a union of them. As regards choirs, however, I think that great advantages would be gained by them by being connected with the Royal Academy of Music, for the following reasons:—Cathedral choirs have only opportunities of practising one kind of music, whereas, by being connected with the Royal Academy, they would be enabled to study music in all its classical branches, as well as theoretically. In addition to this, by performing at the Royal Academy concerts, they would acquire the knowledge of singing with orchestral accompaniment, and at the same time be a valuable acquisition to those performances as a trained chorus.

Q.—7. Does the Royal Academy in any way promote the improvement of military music?

A.—No; as the professors generally have no opportunities of becoming acquainted with the orchestration of military music.

Q.—8. Could any useful connection be established by the Academy with the regimental volunteers or other trained musical bands?

A.—I do not think that any such connection would be desirable or necessary, as the institution at Kneller Hall is strictly confined to the training of military musicians.

Q.—10. What is your opinion respecting—(*a.*) The advantages derivable from public concerts. (*b.*) The test of musical proficiency by examinations. (*c.*) The formation of a national musical library, and of a collection of musical instruments by gifts, loans, &c. (*d.*) The competitive trials of performers and of musical instruments. (*e.*) The use of a standing musical jury, as in the French Institute.

A.—(*a.*) Public concerts are beneficial to musical academies in the following ways:—

1st. The students acquire confidence by performing in public, such as they cannot obtain by private rehearsals. In this respect they are very desirable for solo performers.

2nd. The compositions of students might be performed at these concerts.

3rd. These concerts would benefit the funds of the institution.

(*b.*) The proficiency of a student as a theoretical musician or a solo performer may be ascertained by personal examination; but his capabilities in orchestral performance can only be tested by his co-operation with an orchestra.

(*c.*) I think that such a collection would be very valuable to musical students.

(*d.*) With respect to competitive trials of performers I feel very doubtful of the results. As regards the competitive trials of instruments, such trials have taken place at both our International Exhibitions; but besides these public trials a brisk competition constantly exists between manufacturers, which is obviously of great benefit to musicians. This competition might, however, be augmented by public trials before properly constituted juries.

(*e.*) I think that such a jury would be productive of highly beneficial results to the musical profession, one of the most important of which would consist in their deciding on the merits of the works of English composers.

FIFTEENTH ORDINARY MEETING.

Wednesday, March 14th, 1866; Alexander J. Ellis, Esq., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Chubb, Harry, 33, John-street, Bedford-row, W.C.
Myers, William Henry, 302, Whitechapel-road, E.
Webb, John Stephen, 34, Cadogan-place, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Abbott, Joseph William, 163, New Bond-street, W.
Brown, Allan McLaren, 269, Camden-road North, N., and Marlee, Blairgowrie, Perthshire.
Condy, Henry Bollman, Devonshire House, Battersea, S.W.
Lomax, J. J., Proprietary School, Hereford.
Stepney, Cowell, 9, Bolton-street, W.
Tabraham, Robert, Bellevue House, London-road, Worcester.
Walker, Robert, 10a, King's Arms-yard, Moorgate-street, E.C.
White, Henry Nathaniel, 83, Albion-road, Dalston, N.E.

The Paper read was—

ON VISIBLE SPEECH; OR, A UNIVERSAL AND SELF-INTERPRETING PHYSIOLOGICAL ALPHABET.

By ALEXANDER MELVILLE BELL, ESQ.

The subject of visible speech comes fairly within the province of the Society of Arts; for, of all arts, writing, or the representation of language, may claim to be among the first in importance to mankind. Writing is, in its nature, a kind of "visible speech;" it certainly was originally intended to be so; but we have only to place a page of French, Italian, or Portuguese before an English reader, to discover how very far writing is from fulfilling the purpose of making speech "visible." Although these languages are all written in the same alphabet as English, the reader's knowledge of the letters will not enable him to pronounce the foreign combinations in such a manner as to make the words intelligible to one who uses them vernacularly.

A system of letters which, when learned in connection with any one language, would be vocalised with uni-

formity in every other language, has long been felt to be one of the great wants of the world; and many scholars have laboured at the construction of such an alphabet. But there were insuperable obstacles to success; first, the association between letters and sounds was only arbitrary; and, secondly, international uniformity of associations was impracticable, because the sounds of different languages, and their mutual relations, had not been ascertained with exactitude or completeness. All attempted collations of existing alphabets, consequently, failed to yield the elements of a complete alphabet; and no other mode of attaining a universal system of letters was possible, in the absence of the physiological basis on which alone such an alphabet could be constructed.

Like many other experimenters I had long been engaged on the alphabetic problem; but I worked from different data, and by a totally different process, from those made use of by other explorers. Instead of going to languages to discover the elements of utterance, I went to the apparatus of speech, and, after many partial failures, but with gradual approximations to success, during a long series of years, I had the satisfaction ultimately of discovering, with demonstrable certainty, the complete physiological basis of speech, and of establishing an organic scale of sounds which could not but include all varieties, known and unknown.

A universal alphabet now, for the first time, became possible. To have adopted letters from Roman, Greek, or other alphabets, constructed on no common principle of symbolization, would have been to introduce confusion where all was order, and complexity where all was simple, as well as to create a conflict of old associations where all was new. I therefore discarded old letters, and set myself to the task of inventing a new scheme of symbols, each of which should form a definite part of a complete design; so that if the plan of the alphabet were communicated—as it can be perfectly—by diagrams, each letter would teach its own sound, by expressing to the reader's eye the exact position of the sound in the physiological circuit,—the latitude and longitude, so to speak, by which it may be at once found in the mouth, by speakers in all countries. In this way an alphabet of incomparable simplicity has been produced,—an alphabet really available for all mankind, expressing, as it does, to the minutest shade of difference, every sound that can be formed by human organs.

You will understand, then, that the title, "Visible Speech," implies not merely a universal alphabet, but a scheme of letters which are physiologically *representative* of sounds, and not, like ordinary alphabetic characters, only associated with sounds, arbitrarily, and by convention.

In treating of this subject before a popular audience, I have dwelt chiefly on the more remarkable general and social applications of the invention; before the Ethnological Society and the College of Preceptors I gave prominence to points of special interest to linguists and teachers; and, similarly, in presenting the subject before the Society of Arts, I shall keep in view, as my appropriate theme, the art itself—the *modus operandi* of the system.

In the first place, speech is something heard; and the question naturally arises, "How, then, can it be visible?" This I shall endeavour to explain to you. The only difficulty lies in the total novelty of the idea; the manner of producing the effect is simplicity itself. The principle will be best brought out by analogy.

An artist conveys the idea of laughter by drawing the lines of the face as they are seen under the influence of mirth; and, if written language were made up of pictures instead of letters, we should at once read the word "laughter" in the outline of the laughing face. Every passion has its facial writing, and the idea of every passion might be expressed on paper by a picture of the muscular arrangements of the face, so that all persons seeing the symbols would have a common knowledge of their meaning. Now, it is on a similar principle that "visible speech" is representative of the sounds of languages.

In forming any sound we adjust the parts of the mouth to certain definite attitudes, and the sound is the necessary result of our putting the mouth in such a shape. Thus, you cannot sound O with the mouth in the position for E, or L with the mouth in the position for S; every sound has its own position, every position yields its own sound, and no other. If, then, we can represent the various positions of the mouth, it is obvious that in their symbols we shall have, practically, a representation of the sounds which cannot but result from our putting the mouth in the positions symbolized. Visible speech is the application of this principle of symbolism to every possible arrangement of the mouth, so that, whatever your language, and whether you speak a refined or a rustic dialect, you can show the exact sounds you make use of in the forms of the letters by which you write them. In this way a Chinaman may read English, or an Englishman Chinese, without any difficulty or uncertainty, after he has learned to form his mouth in accordance with the directions given him by the letters.

Nearly all alphabets contain vestiges of a similar principle of relation between letters and sounds, which, there is good reason to believe, must have been applied in the original designing of many of the letters. We need not doubt these evidences because we cannot trace the principle in all the characters of any alphabet, for we do not know what changes the letters may have passed through in the hands of transcribers before the art of printing gave fixity to their forms. Early alphabets were, besides, very limited; and only the most obvious relations could be exhibited. You cannot symbolize what you do not know; and it is not to be supposed that the designers of primitive letters were fully acquainted with the mechanism of sounds, when this knowledge has baffled investigators in all after-times on to the present. If you do not know how you produce a sound, you cannot write it organically; but, on the other hand, if you know how a sound is made you can pronounce it. Visible speech, then, as it shows you how to form every sound, enables you to pronounce every sound. This is the essence of the invention. Each letter explains itself and makes the manner of its pronunciation visible. The effect is, that you can distinguish, and produce at once, varieties of sound which you might have been months in acquiring by unguided imitation. To give you an illustration of this:

Shortly before I left Edinburgh—in the early part of last year—an elderly lady called on me, accompanied by two young ladies who were going out to India as missionaries. The elderly lady had been for upwards of twenty years engaged in mission work, and she spoke the language of the district like a native. Nevertheless, she could not teach the English girls to pronounce some of the peculiar sounds which she had acquired by habit. They had been for some time under her instruction, but they could not catch the knack of certain characteristic elements. Having heard of "Visible speech," the lady called to solicit my assistance. I knew nothing of the language she pronounced before me. Some of the sounds I had never heard in linguistic combinations, though, of course, I was acquainted with them theoretically. I saw the young ladies for only half an hour, but this proved long enough to give them the power of pronouncing the difficult sounds which, while they did not know precisely what to do, they could not articulate. Strangely enough, since I came to reside in London, I heard a clergyman and former missionary, speaking of these very girls, remark on the great success with which they pronounced the Canarese language before they left this country; and the speaker knew nothing of their previous difficulty, or how it had been overcome. I mention this fact because it foreshadows the great advantages which will be universally felt in the learning of languages when the new letters are brought into general use.

In a leading article on "Visible speech," which appeared in one of the newspapers a short time ago, the writer refers to the letter O in the Roman alphabet, as exemplifying a corresponding principle to that of the new letters. He says:—"If you place this letter before an illiterate person, and tell him to put his mouth in that position, and roar, he will immediately produce the sound of the letter." This is, so far, a very apt illustration, but the letter O shows no more than the round form of the lips, which, after all, is not necessary to the sound of O; it does not tell you the position of the tongue, which produces a variety of vowels with the lips in the same shape. Now the letter for O in the visible speech alphabet shows you how both tongue and lips are adjusted, and exhibits the organic distinctions between the Scotchman's O, the Frenchman's O, and the Englishman's O. Nothing apparently could be simpler than the sound of the letter T; yet even this may be written in half-a-dozen different ways, to show the manner in which it is pronounced by different speakers or in different languages. And so of all sounds; shades of difference which the unaccustomed ear cannot recognise, but which are nevertheless real distinctions in one language or another, are all expressed in the forms of the letters in visible speech.

I refrain from saying a word as to the uses of this alphabet, believing that these will suggest themselves to your own minds, my object being to give you a definite idea of the principle on which the alphabet is constructed. Exemplification will supersede description of the nature of elementary sounds. I shall, therefore, first let you hear some varieties of each class of sounds pronounced from their symbols, and then add such explanations as may seem necessary to give you a clear conception of the plan of the alphabet.

I may premise, for the benefit of those who have no previous acquaintance with the details of this subject, that the number of sounds discriminated in different languages amounts to several times the number of letters in the English alphabet, and that the number of sounds in English alone is not less than forty, though we have but twenty-six letters. In the "Standard Alphabet" of Professor Lepsius, adopted by the Church Missionary Society, the number of symbols introduced is 186; but even with this vast number of types, that alphabet is found imperfect for many languages, and additional letters have to be employed. You will not wonder at this when I mention that in the organic actions of the mouth considerably more than 200 varieties of simple vowels and consonants can be discriminated, without including a single diphthong or combination. Now all of these varieties are actually used in languages, dialects, or by individual speakers. I do not propose to tax your ears by exemplifying all the possible shades of elementary sound; many of them, indeed, are too minute to be easily distinguished in separate pronunciation; but I shall let you hear the principal radical varieties of each class of elements.

The first set consists of interruptions and emissions of simple breath; these are whispered consonants:—

(Illustrations of Whispered Consonants.)

The next set of elements consists of interruptions and and emissions of murmur or voice; they are vocal consonants:—

(Illustrations of Vocal Consonants.)

The next set of sounds consists of simple vowels:—

(Illustrations of Vowels.)

Each of these elementary sounds is expressed in printing by a single type, without any dots, lines, or accents, above or below the letters. The total number of types required for printing these and many other modifications of sounds is only thirty. The addition of a few diacritic signs expresses such sounds as the following, which consist of diphthongs and nasal vowels. A small selection only need be given, as you will understand that any possible compound or modification may be written.

(Illustrations of Diphthongs and Nasal Vowels.)

Not only the ordinary elements of languages find their physiological symbols in this alphabet, but interjectional and inarticulate sounds; in fact, any attitude of the mouth, audible or silent. Such effects as the following, therefore, are all expressed in simple a, b, c.

(Illustrations of Interjectional and Inarticulate Sounds.)

All varieties of animal and mechanical sounds also may be perfectly written, the only difficulty being to find out precisely what the organs do in forming the sounds. The following are a few examples:—

(Illustrations of Animal and Mechanical Sounds.)

I have extended these illustrations thus far, in order that you might the better comprehend the minutely directive effect of the organic and functional symbols which compose the alphabet. These symbols, I may add, are as simple to the eye as Roman letters; and they are so definite in their forms that no person of ordinary intelligence would fail to discriminate them after a single explanation. I tested this recently with a little girl ten years of age, who, in the course of half-an-hour, learned to distinguish with certainty the whole of the symbols. A little explanation will enable you to understand how this important result is brought about.

Each symbol has a name, and the name does not include the sound of the letter, but merely describes its form. The learner has thus, at first, nothing to do with sounds; he has only, as it were, to recognise pictures. But the name of the symbol expresses also the arrangement of the mouth which produces the sound, so that when the symbol is named, the organic formation of its sound is named at the same time. The only thing further to be learned, therefore, is the mode of adjusting the mouth in accordance with the symbols.

To estimate the simplicity of this process, you must now be informed of the number of symbols made use of. The total number is thirty. The signification of thirty signs being known, the entire alphabet is mastered. I mentioned before that considerably more than two hundred varieties of simple vowels and consonants could be discriminated. I have only to add that they may all be written by means of these thirty symbols, and that the total number of modifications capable of being represented by the same elementary signs is vastly greater, and very far in excess of all the varieties that languages or dialects present, or that the ear could distinguish.

To give you a clear idea of the nature of the symbols, I shall explain, with a little more of detail, their relations to the organs and processes they represent, and by experimental illustrations afford you an opportunity of seeing how these relations guide the reader in the translation of "visible" into audible language.

In the first place all vowels have a common generic sign, and all consonants another; vocality and whisper have their respective symbols; inspiration, retention, and expulsion of breath have their symbols; organic appulse, vibration, &c., have their symbols; the lips, the soft palate, the pharynx, the glottis, and the different parts of the back, the front, the surface, and the sides of the tongue have their distinctive symbols; the various modes in which the breath or the voice is shut within the mouth or extruded through crevices or passed wholly or partially through the nostrils are all symbolised. Thus every part of every letter has a meaning, and the total number of parts that make up all the letters, diacritic, and radical together, is, as I have already said, only thirty. These thirty signs may be embodied in a larger or smaller number of types, according to taste and convenience, such of the symbols as together represent simple elements of speech being properly combined in single types. The highest possible advantages of the system would be secured by extending the number of

types to about sixty. At present, I and my sons—as yet the only experts in the use of visible speech—write the alphabet in a form that would be cast on between forty and fifty types, which is but little more than the number in an ordinary English fount, including diphthongs and accented letters. This number does not require to be exceeded, in order to print, with typographic simplicity, the myriad dialects of all nations.

The elementary sounds of speech are exceedingly numerous; the combinations are infinitely so. We see the advantages of analytic writing, even in our imperfect and purely conventional representation of words by ordinary letters. How much greater, then, must be the benefits of a perfect analysis—of a resolution of elementary sounds themselves into their ultimate organic elements! The latter are so small in number, and thus may be learned in so short a space of time, that the myriads of illiterate persons in all countries may, in a few days, become qualified to read their own language. But one of the most striking results of this physiological alphabet will be seen in its application to telegraphy. The symbols of speech, in all their varieties, may be transmitted by telegraph through any country, by ordinary instruments, and without the necessity for a knowledge of any given language on the part of signallers. In fact, no other qualification is needed than the mere power of discriminating forms—which the Turk possesses as well as the Englishman. The operator has nothing to do with sounds, and he may be totally ignorant of the value of a single letter, while he communicates with equal facility the exact utterances of a message in any tongue. It is impossible to over-estimate the value of this application of "visible speech," which will render the telegraph as cosmopolitan as the electricity which it commands and intellectualizes. At present, as you are aware, a committee of the House of Commons is engaged in investigating the causes of the telegraphic blundering which has proved so perplexing, often so ludicrous, sometimes so disastrous, in the transmission of messages to and from India. The true remedy for such errors is furnished by this invention. The old and imperfect alphabets cannot serve the purposes of international telegraphy; this complete and universal alphabet supplies the very instrument required. One sentence in an article which appeared some time ago in the *Athenæum* happily sums up the characteristics of visible speech:—"A great many efforts have been made to spell words, but the system before us spells spelling."

I trust that I have succeeded in the object I had in view, and given you, in these details, an accurate conception of the principles on which the system of "Visible Speech" is based. You will, doubtless, need no argument to convince you that the publication of the theory of the system and the scheme of symbols must necessarily be supplemented by oral teaching of the scales of sounds, in order that the invention may be applied with uniformity. I am willing to surrender my private rights in the invention *pro bono publico*, on the simple condition that the cost of so introducing the system may be undertaken at the public charge. A universal alphabet is not a proper subject for private copyright; and the dissemination of a cosmopolitan system of letters is a task beyond the unsupported efforts of a private individual. If you agree with me in this conclusion, the statement of the conviction by the Society of Arts would probably secure the attention of Government to a proposal which, from motives of distrust, or I know not what—apathy it cannot surely be—has not hitherto obtained a hearing.

The only result of my applications to the different branches of the executive has been to elicit the fact that it is nobody's special business to receive such a proposition, and that everybody has some other business to attend to. Meantime the energies of a vast utility are lying dormant; the years are fleeting; and the time will soon come when the willing workers of to-day will have ceased from all ability to labour.

You have now before you the materials for forming a judgment on the theory of "Visible Speech," and for discussing the expediency of your remitting the subject to the Council of the Society, to ask for the acceptance by Government of the offered invention, that it may be made available for the free use of all people.

With reference to the symbols, I may state, in conclusion, that they have been shown to Sir David Brewster, to Mr. Alexander John Ellis, the eminent phonetician, who has been most appropriately invited to preside on this occasion, and to Professor de Morgan, of the London University—three impartial witnesses, whose competency to form an opinion will not be disputed. You will, I am sure, accept their judgment as your own, in reference to the fact that the symbols really carry out the theory which I have explained to you. Their verdict to this effect is unanimous. In the words of Professor de Morgan, visible speech "must be called the final victory over a difficulty as old as written language, and an obstacle which seemed to inhere in the nature of writing itself."

It is only necessary to add, that the new alphabet is adapted for current writing as well as for printing; the forms of the characters merely requiring such slight modifications as common letters receive in the ordinary script alphabet.

I shall now be happy to write any sounds which you may suggest, by way of practical tests. My son will leave the hall while this is being done, and on his return he will describe to you what the symbols tell him to do, and reproduce the sounds from the writing.

At the conclusion of the paper, Mr. Bell's son having left the room, sentences in different languages, French, Arabic, Bengali *patois*, negro dialect, Persian, Gaelic, Scotch, and Norfolk dialect, were dictated to Mr. Bell by various gentlemen present, and by him written down in his symbolical alphabet. Mr. Bell's son then returned to the room and read them aloud with great accuracy.

DISCUSSION.

Mr. HAWES suggested that Mr. Bell would be good enough to write a short sentence in his new alphabet on the board, and let that be read off; it would add greatly to the interest of the subject.

Mr. BELL replied that he had explained the theory of his system, and had offered it *pro bono publico*. He was ready to explain the details of the system to any committee whom the Council of this Society or any other scientific body might appoint, and, if they thought it really valuable, perhaps they would recommend the Government to take it up for the benefit of the public. If he were to write a sentence on the board as requested, it would really add nothing to the knowledge which he had already given them on the subject.

Mr. HAWES said that, as Chairman of the Council, he protested against this apparent reserve on the part of the author of the paper. It was one of the great objects of the Society that everything brought forward in that room should be explained for the benefit of the public. Mr. Bell had very fairly offered the invention to the Government, upon the condition that they would be at the expense of providing the printing types and introducing the system to the public; and he could scarcely imagine that the placing of a short sentence upon the board, in illustration of it, could militate against the success of the invention. In the absence of such an illustration, he did not think the meeting could satisfactorily discuss the subject.

The CHAIRMAN said it was a difficult matter for an inventor to decide how much of his plan he would give forth to the public. Mr. Bell had occupied himself for a number of years in perfecting his system, and he had shown the meeting in a satisfactory way how his symbols recalled to the reader the positions of the organs of speech when producing certain sounds. To illustrate the principle it required more than the writing of a few symbols on the board, and he did not think, from what

he personally knew of the subject, it would enable any one to judge of the capabilities of the system. It had been stated by Mr Bell that his alphabet had been acquired by a little girl in half an hour; but he (the Chairman) found that it occupied him some six or seven hours in fully understanding and appreciating the merits of the system. He thought the offer of Mr. Bell to lay the whole matter before a committee appointed by the Council of the Society, was as much as could be expected of him. The illustrations which which had been given this evening were quite sufficient to acquit Mr. Bell of all suspicion of charlatanism in having possession of a secret which he exhibited as a marvel to the public; and the examples which had been given were a proof of the strictly scientific principles on which the system was based. He thought if it could be made generally available it would be of the greatest value in assisting philological research. It was a remarkable feature of the system that unknown sounds could be written in symbols in such a way as that a person who had not heard them uttered was able to reproduce them with the accuracy they had heard this evening. Having spoken of the various uses to which he considered this system was applicable, the chairman remarked that he approached the consideration of it as a sceptic, but an investigation into it had convinced him of the soundness of the scientific principles on which it was based; and his scepticism entirely vanished when the details of the system were laid before him by Mr. Bell. He should be glad to see some scientific body take the matter up, as he was convinced there was a great deal of practical utility in it. Looking to his own personal experience in connection with the introduction of the phonetic system, he fully sympathised with the resolution Mr. Bell had come to not to take the personal charge of introducing his system to the world.

Mr. CAMPIN thought, after the illustrations of the system which had been given, the offer of Mr. Bell to explain to a Committee of the Society the full details of it was as much as could be expected of him.

Mr. MACKIE said this was the second occasion on which he had heard Mr. Bell's exposition of his system, but he had never been gratified by any visible illustration of the symbols employed. He apprehended that phonetic writing could be adapted to any language, and he thought any one who had read Scott's novels could speak broad Scotch as well as a Scotsman. With arbitrary sounds given to different combinations of letters, imitations of sounds might be produced in any language. It was the object of an audience like the present one to know if there was anything fundamentally good in the system brought before them. He must say he was at a loss for any reason which should induce Mr. Bell to withhold the secret from the world, seeing that that gentleman did not ask for pecuniary remuneration from the Government for his invention, and that he did not intend to patent it. He submitted that definite principles must be laid before the audience before they could judge of the value of an invention, and those principles must be exhibited in a form which they could take cognizance of. If the invention was one of practical utility he was quite sure there would not be wanting the means of producing the types of the new alphabet; many typefounders would be willing to cast them, if once convinced of the practical value of the system.

Dr. CAPLIN stated that although he had been resident in England for thirty-three years he was almost as far as ever from the correct pronunciation of the English language, although he was able to read and write it with facility, and he should be very glad to see a system introduced which would enable foreigners resident in this country to acquire a correct pronunciation of the language.

The Rev. GEORGE SMALL apprehended that the object of this paper was not to reveal the secret of the invention, but rather to incite people to inquire further into it. He had not attended himself in the expectation that he should be taught in one evening a system which had cost the author of it so many years of labour and thought to bring it to perfection. He thought the offer which Mr. Bell had made to lay the details before a committee was a very generous one, and was all that could be expected of him.

Mr. HANCOCK said the principle laid down by the Chairman of the Council in the interests of the Society was one that he fully approved of. The custom of the Society was that no question should be brought before it in a secret form. Although his own views with regard to patents were not so far advanced as those of Mr. Hawes, still he felt it his bounden duty to support him on this occasion. He thought the title and scope of the paper had not been fully realized, and he hoped, if the feeling of the meeting was with the author on this point on the present occasion, it would not be converted into a precedent that secret inventions were to be brought before the Society.

Mr. BLACKIE considered that Mr. Bell had gone as far in the exposition of his system as could be expected of him, and he hoped the meeting would not press him further on the subject. He was not surprised at the Chairman of the Council taking the view he had stated, as he was a known opponent of all patent rights.

Mr. HAWES said this was not an occasion for entering into the discussion of the patent laws, his views on which he was always prepared to maintain. He thought that the present meeting had been brought together by a paper which purported to make them understand "visible speech;" but he confessed there had been nothing in the shape of explanation or illustration which would enable them to carry away the slightest idea of the mode in which the author effected his object. He could not but feel that those who came before the Society to advocate any particular process or system should conceal nothing. Mr. Bell had stated that he had given up his private rights in this invention, and yet he withheld from the meeting even the slightest visible illustration of his system, because he hoped the Government or some other body would undertake the expense of casting the types, by which it would be made available to the public. How could this Society, or even the Government, take up this matter in the present state of information upon it? As to Mr. Bell's proposition to place the details before a Committee appointed by the Council, he thought it was not the function of the Council to be the receptacle of the secrets of inventors. It would lead to all sorts of difficulties, and was a thing which he was sure the Council would not undertake.

Mr. BENNETT did not see that the exhibition of a few hieroglyphics on the board could enlighten the meeting on this subject. It appeared to him, as a commercial man, that a far more important point was involved. The statement of Mr. Crawford, one of the members for the City, before the House of Commons, as to the gross inaccuracies that occurred in the transmission of telegrams from India to this country had led to the appointment of a committee of the House to investigate the subject—showing the great importance which was attached to accuracy in telegraphic transmission. Mr. Bell had told them that by the adoption of his symbols perfect accuracy of transmission in any language, though it might not be known to the operator, could be secured, and he (Mr. Bennett) thought this was a great triumph. If Mr. Bell succeeded in this he would confer a benefit on the commercial world, second only to the telegraph itself.

The CHAIRMAN said that whatever difference of opinion there might be as to whether Mr. Bell was wrong or right in not completely demonstrating his system, he was sure all present would join in a cordial vote of thanks to him for his paper.

The vote of thanks having been passed,

Mr. BELL, in acknowledging the compliment, said he was sorry that some of the gentlemen present appeared to think he had been wrong in not making his system

thoroughly known. He had brought before them his principle with the results they had witnessed, and yet he was asked to show them his symbols. He was in this position—he had discovered something new which he considered to be capable of world-wide application, but he felt that it was no business of his individually to give it that application; it was sufficient for him, having recognized that it had so much value, to express his willingness to give it for the benefit of the public; but if the public would not accept it, he was under no obligation to force it upon them or to publish it in the way he had been asked to do.

Proceedings of Institutions.

Bank of England Library and Literary Association.—The sixteenth annual report congratulates the members on the completion of another year of steady progress and prosperity, the events of which, however, call for but little special remark. A new supplement to the catalogue has been issued, containing an account of all books, &c., added to the library between July, 1862, and the 1st of June, 1865. Mr. W. O. Wheeler, one of the Assistant-Librarians, has resigned his office, and the health of the Librarian and Assistant-Secretary has much improved. The number of the subscribers to the Association is now 485, making, with 10 life members, the total number of 495, showing a slight increase on the preceding years; the number of volumes now in the library is 10,850, being an increase of 543 vols.; and of this increase the donation of Mr. C. P. Grenfell, formerly a director, represents 184 volumes. Mr. R. W. Crawford, M.P., has presented a copy of "Hansard's Parliamentary Debates." The financial statement shows that the receipts have been £298 8s. 2d., and that there is a balance in hand of £8 15s. 1d.

DIRECTORSHIP OF THE ROYAL ACADEMY OF MUSIC.

The *Orchestra* has the following remarks on Mr. Mapes's letter, printed last week:—

"Mr. Mapes, an accomplished amateur and composer of sacred and secular works of merit, has published a letter in an evening paper on the subject of musical education. The main object of the writer is to insist on the necessity of a higher class of educational acquirements than musicians usually possess. Beyond the mere technical knowledge of their art, musicians, he insinuates, are proverbially an illiterate race of persons. He attributes this to the fact of parents of needy circumstances bringing up their children to music at little cost, and encouraging their endeavours to gain a livelihood before they are sufficiently qualified to give sound instruction in their art. These reflections are strongly in favour of a good National Academy, where students may receive gratuitous instruction, complete, beyond the control of indigent or indiscreet persons. We cannot agree with the writer that the director of an academy of music should not be a professional man. Costa's evidence on the discipline of the Neapolitan School under Zingarelli, and the Paris School under Cherubini, is against Mr. Mapes's theory of the lay element. These remarks we hope may reach the ears of those interested in the movement now making to establish a National Music School, on a scale worthy of the nation, and in selecting the right man for the right place."

INTERNATIONAL EXHIBITION OF FISH AND WATER PRODUCTS IN FRANCE.

Mr. James Caird, in a letter to the *Times*, says:—

"Having been requested by Government to act as British Commissioner at the Exhibition to take place at Arcachon in July next, I shall feel greatly obliged if you will allow me to make public the object of that Exhibition. The vast importance of the products of the sea, rivers, and lakes, both as food and for use in the arts, is forcing itself into notice. The French Government have organized an Exhibition illustrative of this, under the presidency of the Minister of Marine and the Colonies, to be held at Arcachon, a seaport near Bordeaux, in July next. They invite from the seaports of their own country, and the fishing ports of their maritime neighbours, contributions to the Exhibition. These are variously classed, and comprehend specimens of cured and preserved fish for food; oil for use as medicine; chymical products extracted from seaweed: shell, amber, pearl, colouring matter, &c., in connection with art; industrial products, such as oils, skin, whalebone, sponges, &c., marine manures, shell sand, and seaweed. Another class includes tools and machines for making boats, models of fishing boats, of oyster-beds, and of salmon ladders; lines, nets, and fishing apparatus, and oyster dredges. Then there are instruments for preserving and smoking fish, with plans and models of curing establishments, and descriptions of modes of packing and transporting fish. There will be collections also of memoirs on the subject of fish and fish culture and management, with plans, charts, drawings, and photographs. For these prizes will be awarded, according to their respective merits, and the cost of transporting the articles for exhibition will be borne, either altogether or in part, by the administration of the Exhibition. It is very desirable that the important fishery interests of this country should be creditably represented, and I shall be happy to receive and reply to any communication on the subject from persons desiring to contribute to the Exhibition. The entry of articles is requested by the beginning of April, and they must be despatched so as to reach Arcachon by the 1st of July."

PARIS UNIVERSAL EXHIBITION, 1867.

The following memorandum on the arrangements for the machinery gallery of the Paris Exhibition is by Captain Festing, R.E.:—

1. By the general regulations for the Universal Exhibition, approved by Imperial Decree of the 12th July, 1865, instruments and processes of the common arts are placed in Group VI., which is divided into 20 classes. A gallery, 115 feet wide and 82 feet high, is to be provided in the building for this group. In breadth this gallery is to be subdivided into a central block, 75½ feet wide, and two side passages, each 16½ feet wide, leaving a space of a little over three feet at each side for counters and glass cases, placed against the partition walls. In the middle of this central block, and running throughout the machine gallery, there is to be a platform, 15 feet wide, supported on columns about 14½ feet high. From this platform visitors will be able to see at a glance the machines exhibited. The columns of the platform will also carry two parallel main shafts for transmitting motion to the various machines, and under the platform will be workshops for skilled mechanics, whose work is to be exhibited as examples of the processes of the common arts. In the words of the supplementary instructions issued by the Imperial Commission relative to the arrangement of this group:—

"It is not enough, in fact, to show to the visitors of an exhibition the mechanical powers characterised by power and speed. In juxtaposition with them must be placed the work of man, showing perfection of taste, manual dexterity, and intelligent precision. In adopting this scheme the Imperial Commission believe that they will remedy an undesirable omission, and at the same time add a perfectly new attraction to the Exhibition of 1867. By this means the Commission hope to suggest comparisons both useful and productive, to bring to light the share of the workmen in the productions of industry, and at the moment when machinery seems on the eve of

absorbing every manufacture, to show that for certain works the hand of man can defy all mechanical competition. A special Class of Group X. (Class 95) comprises the most attractive and ingenious processes carried on by hand-labour, and particularly those suitable to skilled workmen. But some of the Classes of Group VI. are also open not only to the apparatus enumerated in the system of classification appended to the General Regulations (Appendix A.), but also to the workmen achieving, either with or without simple tools, results which these apparatus produce mechanically. The following may be quoted as examples:—In Classes 55 and 56, weaving, rope-making, spinning, embroidering, knitting; and in Class 69 paper-making, bookbinding, &c.

"This Exhibition of manual labour will not excite so much interest unless it be placed in juxtaposition with the machinery with which it contends with more or less success, according to the particular industry. The workmen who are to use manual labour will find, under the central platform mentioned above, a workshop separate from the collection of machines, but sufficiently near to them to render comparisons easy. The portions of this covered ground space thus converted into workshops will be flanked on each side by a passage five feet wide, which will allow visitors to approach and observe in detail the performance of the workmen.

"In order to give greater prominence to the collection of objects comprised in a class, it is desirable that the public circulating in the lateral passages of 5 metres, which extend along the whole length of the gallery, should be able to see the central block displayed as a whole, without being obliged to make their way into it. To effect this object, the Committees should, as much as possible, place the machines upon stages rising from the border of these passages up to the central platform. If necessary, steps with proper foundations rising one above the other would produce this amphitheatrical effect.

"On the other side of the 16½ ft. passage laid out on each side of the central block, tables and glass cases will be placed against the wall for the reception of a multitude of objects, machines or apparatus of small size, which would be lost amidst the large engines placed in the central block. Lastly, the partition walls of the great gallery which has just been described will be available for the exhibition of drawings, trophies, and objects which are of no great thickness. This additional space, which it will be expedient to turn to account, will give a desirable depth to the space where the objects are exhibited. Each Committee should make every effort to obtain for exhibition those little known and attractive processes, each successive stage of which can be followed, showing how the raw material is transformed into the finished product. Under this head may be mentioned the manufacture of paper, completed by the process of printing; spinning, weaving, &c. It will also be desirable, where in any Class the manual labour can be brought into proximity with the mechanical, to find a place for the workmen under the central platform, provided the general arrangements do not suggest a more suitable spot."

2. The cost of all foundations, &c., and all erections and fittings necessary for the proper display of the objects in this group to be borne by the exhibitors.

The motive power for the machines exhibited will of course be procured principally by steam, but other means will not be excluded. Instead of the supply of motive power being carried out, as hitherto, by the administration, it has been decided to employ the system of private enterprise, and to distribute the generators of force at various points round the exhibition building instead of concentrating them in one spot.

3. The whole machinery gallery is to be divided into a number of sections, each of which will have its own system for the supply of motive force.

4. The Imperial Commission will enter into agreements with contractors for the supply of motive power for the various sections.

4. The British Executive has arranged to contract for the supply of motive power to the British portion, which consists of two and a half of these sections.

6. All prime movers are to be inside the building; accumulators for the supply of water under pressure to hydraulic engines should also be inside, as well as reservoirs for gas, compressed air, &c., for working any part of the machinery, if they are free from danger and inconvenience. The boilers or other generators of force which require fire are to be outside the building, at the distance of 98½ feet from the exterior, or about 197 feet from the centre of the machine gallery.

7. Each section of the building will have its set of boilers. From thence the steam is to be conveyed by pipes to the prime movers in the galleries. The prime movers will not be collected in one group, but will be distributed wherever there may be need of motive power, from one horse, or half one horse power, as supplied by gas engines, to that required for the largest machines.

8. The only conditions made by the Imperial Commission with regard to the generators of motive force, is that those for each section should be in a certain position, on one or both sides of, but close to, a road in the park which leads to the entrance door of the section. For each section there may be any number of the same or different kinds.

9. The boilers, shafting, and prime movers will all be considered as objects exhibited, and must be accessible to the public. It will, therefore, be desirable to have as great variety as possible, in order to show the various ways of turning to account the force derived from the combustion of the fuel employed.

10. All machines which work with their own boilers, and which the exhibitors may wish to show in motion, must be placed in the Park. The Imperial Commission will make special arrangements about such machines.

11. Processes which require the use of fire, such as the working of metals, glass-making, &c., must be shown in the Park, and the works will be arranged round the boiler-houses of each section. The exhibitors will have to construct all the necessary buildings for these works, and to plant, turf, and keep in good order the approaches to their establishment.

12. It is suggested by the Imperial Commission that those who wish to exhibit agricultural machines at work which cannot with safety or convenience be placed within the building, should club together to erect in the Park, at their common cost, some inexpensive structure for their machines.

13. Those who may wish to exhibit machines for raising water, &c., may in the same way unite to make a pond in the Park. This pond can be supplied from a well in the French portion of the Park.

E. Robert Festing,
Captain, R.E.

THE IRISH FISHERIES.

At a recent meeting of the Royal Dublin Society, an interesting paper was read by Mr. Hoare, on the "Resources of the Sea Fisheries of Ireland."

The sea fisheries of Ireland from time immemorial are well known to have been subjects of much attention to the naturalist, the cosmopolitan, and commercial man. They have always been treated as a national element, whence great wealth may be derived; and the immense amount of employment obtained in their development renders this question of paramount importance. With respect to the natural productiveness of the Irish fisheries different opinions are entertained. By some it is alleged that the abundance of fish said to exist off our coasts is greatly exaggerated, and, in support of this

opinion, ask, if the supplies are so colossal as represented, why is it that so few are captured? The Commissioners appointed in 1863 to inquire into the sea fisheries of the United Kingdom, in their report recently published, take this view of the question; but to those acquainted with the manner in which they conducted their inquiries in this country such assertion will not cause surprise. The extent of their knowledge concerning the Irish fisheries may be inferred from the following statement (page 63), that "Foreign fishermen have never been known to fish off the coast of Ireland." If we refer to any period extending over thirteen centuries, of which we have historical and traditional records, we find at every place where the fisheries were properly and systematically worked there is undeniable evidence of a superabundant supply, and the immense quantities taken sustain the contrary argument. Mr. Hoare described the condition of Irish fisheries from the earliest times, and gave much useful information as to their value and importance. He observed, with respect to the state of the fisheries at the present time, the official statistics are meagre, limited, and unsatisfactory. The Scotch introduced the cotton net, from which time the fisheries have been improving. This improvement the most casual observer must justly attribute simply to development; on the east coast the returns show an increase since 1860 of nearly 500 per cent. This favourable result has not arisen from any influx of the natural supply, but from the increased number of vessels, and the superior appliances employed in the fishery. At Howth official statistics show that the quantities of herrings sold last year from 28th May to 31st of December, realized an aggregate of £94,274. This immense sum was produced during 110 days, by English, Scotch, Manx, and native boats. Here our official information ends. Throughout the entire of Ireland we only know the product of one station, and from such limited knowledge we are at liberty to deduct whatever inference we please concerning the residue, but this at a few places has been supplied by individuals who have taken an interest in the matter. At Arklow we are informed by a gentleman, resident and connected with the fishery all his life, that £23,000 has been paid them for fish taken and sold there during last year, but of which no mention is made in the report of the Board of Works. Again, at Ardglass, it appears, from a recent communication in the *Times*, that last year £21,450 was paid there for herrings caught off that part of the County Down, but as this place is not even mentioned in the report, how are we to know whether this statement is authentic? To my certain knowledge one firm has paid in two months over £15,000 for herrings caught there this year, 1865. At Kinsale, on the south coast, the mackerel fishery has become most productive. Its development has been prosecuted by Scotch, Manx, and Howth boats, which are superior to those used by the local fishermen. In order to illustrate the advantages the large boats enjoy in this fishery, I will quote the following paragraph from the *Cork Examiner*, April 13, 1865:—"One small boat belonging to Kinsale received for one night's haul £44. The number of fish in this take was not quite half the maximum of what had been taken in the Manx boats." This fishery, during March, April, and May, has been most productive, which must be attributed exclusively to development. I believe £20,000 has been paid at Kinsale for mackerel, most of which, as at Howth, goes into the pockets of Manx, Scotch, and Englishmen. Efforts have been made, and are being still made, at Howth and Balbriggan, to manufacture herrings for the home market. Those efforts, although subject to the greatest opposition, have nevertheless been successful, as some correspondence in the *Irish Times*, copied from the reports of the Scotch Fishery Commissioners, shows that the importation of Scotch herrings since 1854 has decreased nearly 50 per cent. In this instance we have undeniable proof that the development of one fishery on one part of the co[ast] has been the cause of replacing Irish herrings wh[ere] Scotch previously reigned absolute.

Last year (1864) there were cured at Howth over 5,[...] barrels of herrings, as everyone acquainted with the tr[ade] is aware, but we find no notice of the circumstance in t[he] report of our Commissioners, although it is recorded [in] the Scotch report. Every measure that can be conceiv[ed] is promulgated to discourage this branch of the busin[ess] which is so beneficial in Scotland. Frequent appli[ca]tions have been made for permission to erect eith[er] temporary sheds or permanent buildings to protect t[he] industrious women and children employed in gutti[ng,] packing, and cleansing the fish, according to the m[ost] approved system; but the Board would not entert[ain] these proposals. On the contrary, they used eve[ry] means in their power to discourage the immense e[m]ployment derivable from this branch of the busine[ss,] and by that means they violated that law whi[ch] they have been appointed commissioners to execu[te.] Mr. Pim, whose philanthropy during the famine was [...] striking, and whose work then published on the conditi[on] of Ireland is to be found everywhere, remarks th[at] the harbour accommodation and fishery piers wer[e] by no means sufficient for the protection of the fisherme[n] on a coast so much exposed to storms and open to [...] the full force of the ocean. During 1846 and 18[..] £90,000 was voted to be applied for the erection of pie[rs] and harbours; but this fund, like all others in connectio[n] with the fisheries since their management was given to t[he] Board of Works, was distributed to suit their conv[e]nience, and the consequence was that they only expend[ed] £74,700, but what became of the residue we are n[ot] informed. The engineering judgment displayed [in] erecting these piers was really shameful. Now, let [us] look at Scotland. The report of the commission[ers] appointed to inquire into the sea fisheries of the Uni[ted] Kingdom, recently published, states that the moneys sp[ent] in the making and maintaining fishery piers and harb[ours] in Scotland since 1829 amounted to £147,242 14s. [...] Now, in face of all the encouragement the Scot[ch] fisheries received, let us see if they were more producti[ve] than the Irish. Let us take the head centre of t[he] Scotch fishery, Wick, where, during 1864, the aver[age] number of fishing boats was 976, and the average catch per boat was 92 crans, or 120 mease. The only statisti[cs] we possess concerning the Irish fisheries, as I have befo[re] remarked, are at Howth. The returns at Howth sh[ow] that during 1864, the average number of boats was [...] and the average catch per boat was 1,069 mease. The[se] figures are incontrovertible. They give us the reaso[n] why the Scotch preferred Dublin Bay to their ow[n] fisheries, notwithstanding all the support they have re[]ceived from the Imperial Treasury. The Irish fisher[ies] only require development, management, and a litt[le] capital.

In the discussion that followed

Mr. Barry, Commissioner of Fisheries, said the[re] were one or two facts to which he was able to bea[r] testimony. For the last few years they were blessed [with] a most unusual influx of herrings upon the eastern coa[st.] From the 3rd June to the 23rd December 72,932 mea[se] of herrings had been caught on the coast, and had bee[n] sold at from 32s. to 12s. 1d. per mease, or an average [of] 19s. 8½d. per mease, amounting in value to £72,134 4s.[;] that was at Howth alone. The total catch at Arklow fo[r] the last season amounted to 30,000 mease, the averag[e] price of which might be set down at 14s. per mea[se,] realizing at least £21,000. This was highly importa[nt,] and went to show what the resources of the country we[re.] In reference to the branding system, alluded to by M[r.] Hoare, he agreed with that gentleman. He believ[ed] that the spirit in reference to branding in Scotland wa[s] one of monopoly, got up by the large curers, and t[o] oblige small curers to flock into them with their littl[e] quantities in order that they might be enabled to sell th[eir] herrings at good prices.

Lord Longford said that the case of the Irish fisheries appeared to be the same as that of the Irish land—great capacity in both, but very scantily developed. In comparing the case of the Scotch and Irish fisheries, it seemed to be inferred that the success of the Scotch fisheries was to be attributed to the encouragement they had received from Government and elsewhere. If the same support was given to the Irish fisheries, he believed they would be as successful as those of Scotland.

Manufactures.

Cotton Manufacture in California.—According to the *New York Herald* manufacturing is extending in California at a gratifying rate—so rapidly, in fact, that the growth of cotton in that state promises to receive a fresh stimulus. Cotton goods, manufactured in California, have recently, for the first time, been offered for sale in the San Francisco market. They were manufactured in Oakland, a new mill having been lately finished there. Considering the fact that the machinery is stiff, the operatives not yet fairly settled down to their work, and the inferior quality of the raw material, the goods are creditable as a first effort. At present only eleven looms are in operation; but soon there will be thirty-two in use, when it is expected the daily production will reach from twelve to fifteen hundred yards. By an act of the Californian State Legislature, a premium of 10,000 dollars has been offered for the first production of certain amounts and descriptions of cotton goods, and the Oakland Mill is in a fair way to obtain it. At present the factory is running on Mexican cotton, which is short stapled, and not altogether adapted for some kinds of goods; but next year it is hoped to obtain a supply of raw material of native Californian growth, sufficient to obviate the necessity of importing supplies from Mexico or elsewhere. Several hundred acres of cotton are now under cultivation in the southern portion of the state, and its successful production within the limits of California is already satisfactorily demonstrated.

Use of Hydro-fluoric Acid in the Manufacture of Sugar.—The *Journal des Fabricante de Sucre* says:—"Notwithstanding the numerous improvements in the manufacture of beetroot sugar during the last ten years, the molasses, which contains 52 to 56 per cent. of crystallizable sugar, has not as yet been freed from the salts which hinder the crystallization, and it must either be consumed as it is, or used in the manufacture of alcohol or of potash. Manufacturers are still in search of an acid which, without injuring the organic matters, should remove the alkalis contained in the beetroot juice, or in the lime employed in defecation. It has long been known that hydro-fluoric acid has this property, and the fact induced M. Frickenhauss to undertake a series of experiments which have demonstrated, on a small scale, the action of this acid. Using 4 per cent. of lime and the corresponding quantity of hydro-fluoric acid, he obtains a juice which could not have been made by any other defecatory process. His experiments also show that the sugar undergoes no change from the hydro-fluoric acid, that it is possible to apply it to the raw juice, and that the action of the clay mixed with the juice becomes even more energetic than under the old system. Last December, in the Friedens-Au factory, the process was tried on a defecating boiler holding 1,200 cwts., to which first 4 and afterwards 8 cwts. of hydro-fluoric acid, much expanded at a temperature of 40° centigrade, were added; this was afterwards removed at a heat of 70° centigrade by 14 lbs. of lime. The juice was perfect, and marked 87 to 88 per cent. on the polarimeter, while by the ordinary process it only marked 79 to 80. The expenses were also much smaller."

Irish Manufactures.—Silk manufactures, since their introduction by French emigrants, in the beginning of the last century, have been confined to Dublin; its chief branch is tabinets, or Irish poplins, which still flourishes. The woollen manufacture, which was nearly extinguished at the Revolution, recovered for some time after, but is now confined to Dublin, Cork, King's County, Waterford, Kilkenny, and Queen's County. There appears to have been a positive decrease of factories in use between 1839 and 1850, no doubt owing to a decline in the trade, which has revived since, and these discontinued factories have been re-occupied. The total number of counties manufacturing is ten, and in these there are only four in which there are a hundred persons employed in the aggregate, viz., Kilkenny, Dublin, Cork, and Westmeath. The trade has entirely left Kildare and Wicklow, and has been established in Fermanagh, Limerick, Meath, and Westmeath, since 1839, and a great improvement has been made in the machinery. The cotton trade is found in six counties only; it has entirely disappeared from six. In 1862 there were 1,412 persons employed in this trade in the county of Waterford, 639 in the county of Antrim, and 492 in the county of Dublin. There is not in any county a single instance of the number of cotton-mills increasing since 1839—in Londonderry and Tyrone, however, it is new. In 1862 the total number of mills was nine, and the number employed 2,734. A new factory has lately been erected at Drogheda. A great source of employment for females has of late years sprung up in the North of Ireland in the working of patterns on muslin with the needle. Belfast is the centre of this manufacture, which employs about 300,000 persons, chiefly females, scattered through all the counties of Ulster and some localities of the other provinces. About forty firms are engaged in the trade, some being Irish houses and others agents for Scotch firms, and the gross value of the manufactured goods amounts to about £1,400,000.—In 1860, the year before the repeal of the duty on paper, 9,314,985 lbs. of paper were manufactured in Ireland, being an increase of 1,022,524 lbs. on the previous year; the quantity made in 1847 was only 5,711,546 lbs.

Commerce.

Sugar from the Sorghum.—"With regard," say Messrs. Travers, "to the sugar supply of America from home sources if the beet fail, there appears to be good reason for hope that the difficulties which have attended the utilisation of the sorghum will sooner or later disappear. The National Sorghum Convention is now sitting in Washington. 'The Convention,' says the *New Orleans Picayune*, 'has decided upon a definite classification of the different varieties of canes, which will be published, with accurate botanical and popular descriptions, and carefully-executed engravings.' It is rumoured from New York that a method has been discovered of extracting crystallisable sugar from the juice of the sorghum. If this process be commercially successful it will be of the highest importance, as the climate of the Western States appears to be well suited to the plant. At present the greater number of farmers in the West have small plots of the sorghum, from which molasses is made."

Trade in France.—The French Director-General of Customs has recently published a comparative statement of the trade of France in the year 1865 and in former years. The value of merchandise imported into that country in the year 1865 amounted to 2,782,000,000f., exceeding by more than 254,000,000f. the imports of the year 1864. The exports during the same period exceeded those of the previous year by 275,000,000f. The merchandise exported in 1861 amounted to only 1,926,260,000f., and reached nearly 3,200,000,000f. in 1865, showing an increase of 1,273,000,000f. within five years. The importation of precious metals into France in the year

1865 exceeded the exports by more than 223,000,000f. The sums received by the Minister of Finance from the two sources of revenue—the customs and assessed taxes—in the year 1865, amounted to 741,000,000f., against 672,000,000f. in the preceding year. This surplus is derived from the assessed taxes, the customs having produced 2,346,000f. less in the year 1865 than in 1864.

Colonies.

Agriculture in Queensland.—The wheat crop promises to exceed that of any previous year; there is a much larger area under this cereal than is generally conceived, many districts being self-supporting as far as wheat is concerned. These seasons prove that wheat-growing is eminently fitted for Australia, it being able to withstand droughts that wither up other crops, such even as maize. On drained land the crop is really fine, and even heavy, 40 bushels to the acre not being unusual, while the quality is first-class. The success of sugar growing has at length been placed beyond a doubt, and the consequence is that sea-coast lands are not to be had unless at heavy prices, capitalists gathering them all up, while railways are being surveyed by private enterprise from Ipswich and Brisbane to the older settlements on the coast.

North Australia.—Mr. Howard, master of H.M. surveying vessel *Beatrice*, has presented to the Governor of South Australia an interesting report of his survey of the Northern coast of Australia, and especially of the Victoria and Adelaide rivers, on which a good deal of interest now centres, in connection with the future settlement of this portion of the continent. It appears that the coast-line has undergone a good deal of alteration since the survey of Captain Stokes, owing to the shoaling up of the river mouths, and the alteration of the currents and tides. Whether the Adelaide river or the Victoria river is to be the seat of empire in North Australia is a question on which Commodore Howard attempts to throw some light in his present report. From this report it appears that the coast-line of the Northern territory has now been examined from Adam's Bay to the Victoria river, that several detached places to the eastward have been looked at, and that the Adelaide river has been again explored. The result is, according to Mr. Howard, that he has seen no place better fitted for a first settlement than that chosen by Mr. Furness, and that the only harbour which could have been selected with advantage is Port Darwin. So satisfied is Mr. Howard that Adam's Bay will become the port of call for shipping sailing northward, that he proposes, as his next work, to undertake a detailed survey of Clarence Straits and the passages through the Vernon Islands. The impression which this report leaves on the mind is that North Australia is a fine country, that the climate is good, and that the natives might be easily dealt with, but that the handful of settlers of Escape Cliffs are leading a hopeless, despondent life.

A New Zealand paper says:—"Considerable progress is being made in the work of introducing the improved machinery and processes of England amongst us. A large brass and iron foundry, having all the modern mechanical appliances of the best kind, used in the most extensive machine-rooms at home, has been constructed, and is now in working order."

The International Exhibition of the products, arts, and manufactures of New South Wales, Queensland, South Australia, Western Australia, Tasmania, New Zealand, and Victoria, to be held during the present year in Melbourne, promises to assume proportions somewhat beyond the calculations of its authors. It is estimated that from the growth of manufactures and the general progress of the colonists since 1861, the space required by Victorian exhibitors alone would need an edifice at least double the size of the present exhibition building, so that if the six adjoining colonies only contribute in moderation, the aggregate collection of objects will be very large indeed, and will necessarily involve the erection of a new and very capacious building.

Exhibition of Polynesian Curiosities.—A collection of curiosities from some of the Polynesian islands, procured during a recent cruise of H.M.S. *Curaçoa*, have recently been exhibited in the Church Society's room, Philip-street, Sydney. In conjunction with the official purpose of his late cruise, Sir William Wiseman undertook to procure from those islands that could be conveniently visited specimens of their natural productions and of their manufactures, and the collection of curiosities obtained during the four months' cruise has surprised all who inspected it, as much on account of its size and completeness as of the beauty and rarity of many of the specimens. The exquisite plumage of the birds, and the beauty of the corals and shells in the South Sea Islands are well known; but though various specimens have occasionally been obtained, such an extensive and varied collection of them had not before been seen in Sydney. The proceeds of the exhibition, which has attracted a large number of visitors, are to be divided between the missions connected with the islands.

The Drought in Australia.—The accounts from all parts of the Western and South-Western interior were such as to cause gloomy forebodings. The Lachlan correspondent of a Sydney paper says:—"Go where he will, the traveller sees a burnt-up grassless wilderness, the dry beds of watercourses and lagoons, which have hitherto, and until of late, supplied one of the two great elements of life to our flocks and herds, and so far as animal life is concerned, abundant evidences of misery. The wildfowl of the interior, whose habit it is to eschew the haunt of men, are driven in by drought to quench their thirst at our rivers and the few remaining water-holes containing water which are left to us, and are actually growing tame. Aquatic birds, strangers in these parts in ordinary times and seasons, are now no longer so. Even the habits and haunts of the finny tribe are affected by the absence of rain and the scarcity of water. Although even swimming in hundreds through the transparent water, they decline the bait, and are almost impossible of capture. Several stations fronting tributary creeks of the Lachlan have been recently abandoned, the cattle being left to follow their own instincts."

Obituary.

John Dixon, of Darlington, civil engineer, died on the 10th October, 1865. His death is worthy of remark, as he was the oldest railway engineer of the day, having been the resident engineer on the Stockton and Darlington Railway under the celebrated George Stephenson when he made his first attempt at railway engineering; and it is singular, that after executing various railways in different parts of the kingdom, Mr. Dixon should return to Darlington to end his days as consulting engineer to the Stockton and Darlington Railway Company, in whose service he died, having been from 1820 to 1865 actively engaged in the construction and management of railways. He was born at Cockfield, near Raby Castle, Durham; his father was a colliery owner as well as a land-surveyor and colliery engineer; and from him he received that sound, practical, and scientific knowledge which was of especial service to him in after-life. It may be noticed that his grandfather's brother was selected by the Royal Society to go to Bencoolen, in Sumatra, to take observations of the transit of Venus across the sun's disc in 1761, and also to go to observe another transit of Venus at the Island of Hammerfest, near the North Cape, in 1769. When the question of making a communication between the Durham collieries

ıd a port of shipment was under discussion, Mr. John ixon was able to give some very useful information, ıving in his possession plans and sections which his andfather, George Dixon, a man of scientific eminence . the county, had prepared about the year 1760, when proposed canal communications with the collieries. 'hen George Stephenson was consulted as to the conruction of the Stockton and Darlington Railway, Mr. ixon was engaged to show him the plans and levels in is possession, and to accompany him in examining the strict; a strong friendship then sprung up between iem which lasted through life. During the construcon of that line Mr. Dixon remained at Darlington as r. Stephenson's resident engineer; and it was during is period that Mr. Stephenson's only son, the late obert Stephenson, received from Mr. Dixon his first istruction in taking levels and surveys, and in setting ut railway works. Mr. Dixon was George Stephenson's esident engineer on the Canterbury and Whitstable ailway, on which was constructed the first railway ınnel. He was resident engineer at the Manchester ıd of the Liverpool and Manchester Railway; and mained for some years after its completion in charge f the maintenance of way and works, and of the locootives, a post of great responsibility; there being at ıat time no experience to guide engineers as to the lative durability of the different working parts of comotive engines, or of the best modes of repair. fter constructing the Birmingham and Derby, the hester and Birkenhead, and the Carlisle and Whiteaven railways, he returned to Darlington in 1845, here he remained till his death. Mr. Dixon might, erhaps, have attained higher eminence, and have been ore known to the public generally, had he been a man f more ambition; but his retiring nature led him at all mes to shun publicity.

Publications Issued.

CHEMICAL HANDICRAFT: CLASSIFIED AND DESCRIPTIVE ATALOGUE OF CHEMICAL APPARATUS. By John Joseph riffin, F.C.S. Demy 8vo. (*J. Griffin and Sons*, 22, *Garrick-street, Covent-garden.*)—This work, which is illusrated by sixteen hundred engravings on wood, is, in he main, a price current of chemical apparatus, but it s something more than that. If, indeed, its commercial haracter were separable, the residue of the work might airly be considered a report on the apparatus which the hilosophical chemist has at present at command, to aid his original researches, or to demonstrate the truth dduced in his teachings. In fact, much of the work is of the nature of a treatise on what is termed chemical nanipulation. Under the heads of air pumps, lamps, urnaces, gas burners, blast furnaces, blowpipe apparatus, volumetric analysis, and in many other places, he reader will find the results of numerous original experiments. By a careful classification of the apparatus, and by the use of abundant figures and short descriptive notes, a considerable mass of information on practical points has been condensed into the work.

Notes.

RAILWAY CARRIAGES.—It appears that new carriages have been built in Milan to run upon the long line of railway from Susa to Brindisi, which is to convey the Indian mails and travellers from England. Some of these carriages are adapted for families or parties of friends. They are rather longer than the usual carriages, and divided into three compartments, communicating by sliding doors. There is the ante-room for servants, the sitting-room with four convenient sofas, upon each of which one person can sleep, a bedroom with a bed for two persons, washing apparatus, &c., while in the daytime the travellers can walk up and down through the three compartments.

STEAM HOIST.—The *Builder* says that at the Newark Castle Wharf a steam hoist (without any engine), made at the Trent Iron Works, has been successfully tried. A timber frame, forming the base of the machine, encloses a large cylinder. On the steam being admitted to it, a beam of iron, armed with strong teeth, is forced out, and from this motion is given through a simple arrangement of wheels, which causes the chain barrel to revolve. The direct action of steam is thus brought into use without the intervention of a steam-engine, as in ordinary steam cranes. The working is easy, and without noise. This particular machine was designed for raising building materials at some of the large iron furnaces now being constructed in the North of England. A Mr. Nicholson is the inventor.

SUICIDE IN FRANCE.—The extraordinary increase in the number of suicides in France is one of the saddest and most inexplicable facts in the social history of the present century. The progress of self-destruction exhibits a frightful rapidity, which seems to have become almost a law during the past forty years. Mercier, in his *Tableau de Paris*, estimated the number of suicides in 1783 at 150; Dr. Brouc established the average of the years 1794 to 1804 to be 167, and that of the years 1814 to 1823 at 334. There is no doubt that the estimates, especially the earlier ones, are somewhat questionable; statistics had not then received the attention which has since been given to them, and facts were not recorded with the same care that they are in the present day. More recent returns, however, may be taken as accurate, and the following is the account given by M. Legoyt of the suicides which occurred between 1826 and 1861:—

	Annual Average.	Proportion per million of Inhabitants.
1827 to 1830	1,739	54
1831 to 1835	2,119	64
1836 to 1840	2,574	76
1841 to 1845	2,951	85
1846 to 1850	3,446	97
1851 to 1855	3,639	100
1856 to 1860	4,001	110

By this table it appears that the annual number of suicides has nearly doubled in a quarter of a century. It will be seen, however, that the ratio of increase has diminished from twenty to ten per cent. per annum. The relative extent of the evil may be illustrated by the fact that while the suicides in France amounted to 4,000 per annum during the last period given above, those in England and Wales, in 1861, amounted, according to the inquest returns, to 1,327, or about 66 per million of inhabitants against 110 in France. Earnest attempts have been made in France to ascertain the cause of this frightful increase in self-destruction, but without any satisfactory result. As regards the circumstances leading to suicide, the following is the result of the examination of 1,415 cases:—Misery, 185; weakness of mind, hypochondriasis, &c., 185; intemperance, 173; severe misfortunes, 133; embarrassment or reverses, 106; domestic unhappiness, 98; *ennui* and disgust of life, 97; misconduct, 93; insanity, 89; incurable diseases, 65; idleness, 38; remorse and dread of dishonour, 34; blighted or disappointed affections, 33; want of work, 28; gaming, 21; jealousy, 16; doubtful motives, 14; inordinate pride, 6; and delirium, 1. Another examination of 4,285 cases gives the following result:—126 who committed suicide were rich; 571 in easy circumstances; 2,000 gaining sufficient for their support; 256 in difficulties; 159 ruined; 709 poor; and 464 only in absolute misery; by which it appears that in more than three-fifths of the cases referred to want was not the immediate cause of suicide. The result, as regards education, is equally unsatisfactory. Out of 3,086 suicides, 573 are reported as well educated; 789, sufficiently educated; 1,659, poorly educated; 8, very poorly educated; 65, totally ignorant. Thus the total y

gnorant, it will be seen, were a very small minority. Moral character affords no better safeguard it would seem against suicide than education, for out of 4,595 cases, we are told, 1,945 were by persons whose character is described as good, 1,196 as unknown, and 1,454 notoriously bad. Of the last, 780 are declared to have been drunkards, 410 as having led a disreputable life, 170 as guilty of adultery, 50 as gamesters, and 44 had committed robbery. The greater number of suicides occur between the ages of 20 and 50, and instances of youths committing self-destruction are, as might be expected, much more rare than those of old men. In 1854 a Russian peasant of Mohilow is reported to have hung himself at the age of 120! There is but one inference that can safely be drawn from the above facts relative to suicide in France, namely, that poverty is not the most common cause any more than ignorance, but the indulgence of the passions and the effect of imagination on weak minds.

Archæological Museum at Athens.—A Museum of antiquities is about to be established on the classic soil of Athens. The Greek Government has granted a spot of ground for the purpose on the hill of Saint Athanasius, and has approved the plans for the building submitted by Professor Lange, of Munich. Every true lover of art must rejoice at the establishment of a museum to receive the artistic and antiquarian relics which are constantly being brought to light in the neighbourhood of the capital of ancient and modern Greece. It is said that a Russian merchant, resident in Greece (M. Bernarkiski) has given a sum equal to eight thousand pounds towards the accomplishment of the object in view, and has promised another subscription of the same amount when the works are actually commenced. Many other connoisseurs have followed M. Bernarkiski's example, and thus the scheme, which has lain dormant many years for want of funds, is now likely to be carried out without delay.

The French Dead-Letter Office.—The post-office of a great city is naturally the scene of a greater mass of curious errors than can be found in almost any other establishment. The Director-General of the French post tells us that the errors committed by the officials of his department amount to 1¼ per cent. per thousand on the whole correspondence; but many of these mistakes arise out of the carelessness or bad writing of the senders—for instance, letters addressed to the Rue du Havre, Rue de Londres, Rue d'Amsterdam, without the word Paris, and often with the small letter *r* to represent the word *rue*, are sent to Havre, London, or Amsterdam, and only arrive at their proper destination after much trouble and loss of time. The errors committed by the public are much more numerous, and in 1849 the number of letters which reached the dead-letter office amounted to nearly four millions and a-half. The improvements which have been made in the department have, however, now reduced that annual total to little more than two millions, of which three quarters consist of letters refused by those to whom they were addressed, rather more than one quarter of letters addressed to persons unknown, of a hundred thousand incompletely addressed, and of more than a thousand (or about three per diem) posted without any address at all. The Director-General has adopted one means of reducing the number of errors which, from its truly radical character, deserves to be mentioned—it consists in an appeal to the masters of all the public schools to make the distinct and careful addressing of letters one of the items in education. In fact, the Government has adopted the suggestion, and now the method of folding and addressing letters is taught in all the commercial schools of France; and, as in the rural districts the young act as the secretaries of their uneducated elders, the improvement marches rapidly. Some of the errors recounted are very curious; for instance, a letter was posted in Paris with the address, "To M. Bernard Sultan crète—Mediterranean." It was sent to every port in the Mediterranean, voyaging backwards and forwards for many weeks, but arriving at last at the Dead-letter Office, an ingenious official sugges[ted] that it was intended for M. Bernard, of the ship *Ta[n]crède (Sur le Tancrède)*, in the Mediterranean, and so [it] turned out. One of the oddest addresses was that affi[xed] by a German who had visited Lyons; he wrote to a pers[on] in that town, and having forgotten not only the numb[er] of the house but also the name of the street, he addres[sed] the cover, "To M———, who lives in the house n[ear] which there is a heap of snow." The letter was return[ed] to the writer, who said it was addressed well enoug[h], only the post-office people had taken it to Lyons in sum[mer] instead of in winter. Such a case as this pro[ves] the good sense of M. Vandal, the Director-General of t[he] French Post-office, in calling the school-master to his a[id].

Public Charity in Paris.—A return has recent[ly] appeared of the amount expended by the administrati[on] of public charity during the year 1863. The gross tot[al] expended was nearly twenty-four millions of francs, [or] rather less than half a million sterling. Of this su[m] about one-fifth was employed in dispensing relief in th[e] homes of the poor, and the remainder for the hospitals, asylums, and the expenses of the central administration. The number of persons who received out-of-door relief in the year in question was 101,570, of whom 21,66[.] were men, 35,432 women, and the remainder children, forming in all little more than forty thousand families. The proportion of indigent in relation to the total popu[-]lation of the city was one to sixteen and a half. Th[e] average amount bestowed upon each family relieved wa[s] 85 francs, and that on each individual 33 francs. Th[ere] are no poor houses or poor rates in Paris, but charitab[le] committees exist in each of the arrondissements of t[he] city, and contributions are solicited and collected fr[om] house to house. The expenses of the hospitals a[nd] asylums form a part of the regular budget of the mu[ni]cipality, aided by the state. There exist also ma[ny] special charitable institutions, amongst which t[he] *Orphelinat du Prince Imperial* is conspicuous. Th[is] establishment was founded immediately after the bir[th] of the young prince, and has to the present time recei[ved] and brought up 430 orphan boys. When old enough and educated to a certain point, the boys are placed ou[t] in families to learn a trade; and a sum, which avera[ges] about ten pounds a year, is allowed from the funds o[f] the establishment to the boy's master until the appre[n]ticeship is terminated; the surveillance of the instituti[on] continues in any case until the orphan has attained the age of twenty-one. A large proportion of the orphans choose the trades of jewellers, cabinet makers, and lock-smiths, and a certain number enter the army. The total annual expense of the establishment is about two thousand pounds, or 50,000 francs, towards which the Emperor subscribes 30,000, and the city of Paris 2,000; the special contributions received last year in[-]cluded one of 50,000 francs by the Marquis d'Audig[...] de Marcé and four others, ranging from a gift of o[ne] thousand francs to an annual sum of six hundred francs, and the smaller contributions make up a sum of abo[ut] 7,500 francs a year. The number of orphans no[w] learning trades and aided by the institution is more th[an] two hundred.

Public Education of the Cossacks.—During the la[st] few years great efforts have been made to improve th[e] intellectual condition of the Cossacks, which eight ye[ars] ago was most deplorable. In 1858 there were o[nly] 2,384 pupils in the schools amidst a population of 896,[...] Don Cossacks, or one pupil for 380 inhabitants; in 18[..] so much improvement had taken place that the ratio ha[d] reached to one pupil for every 74 of the population. The proportions given for the other tribes, for the la[st] named year, are as follow:—The Cossacks of the Kou[ban] and of the Torek counted 5,077 at school, being in th[e] ratio of one to 100; the Cossacks of Orenbourg, 4,216, o[r] one to 56 inhabitants; those of the Ural, 1,346, or o[ne] to 69; those of Western Siberia, 1,842, or one to 3[.]; and those of Eastern Siberia, 1,954, or one to 82 in[-]habitants.

Correspondence.

Management of Ships' Boats.—Sir,—Although I was present at the reading of the paper by Mr. Gray, on the 21st Feb., I did not take part in the discussion, because the particulars of my facts and dates had for the moment escaped my recollection. The following is extracted from a lecture delivered by me in this Institution in 1859. A paper on the same subject was read before the Society of Arts (*Journal*, vol. i., p. 169).—"About five years ago I was casually lounging through the docks at Liverpool, and conversing with one of the sailors belonging to one of the numerous steam-ships, I pointed out to him the improper manner in which the boats were secured, and cautioned him that inattention to apparently such small particulars might one day cost many lives. Within six months that day did come, and those boats were useless. In the evidence that was afterwards taken on the subject, it was proved that they were carried down with the ship, when she sank, and were not disengaged from her till sixteen hours after the accident. Many lives were lost." Surely, better than legislation—than certificates to shelter themselves behind—would be to punish the Captain with some months on the treadmill, and the owner by a heavy deodand on the ship.—I am, &c., Wm. Stirling Lacon.

Royal United Service Institution, Feb. 23, 1866.

Ships' Boats.—Sir,—The present agitation for the safety of life-boats in cases of shipwreck at sea, makes me ask how it has happened that the collapsible boats constructed by Mr. Berthon have been entirely overlooked for so many years. His boats fold longitudinally, and four of them can be stowed in the space required for one of the ordinary construction. They are beautifully shaped for sailing, and are unsinkable, even with a few holes in the bottom. They are lowered from the ship's side in their collapsed state, and on touching the water open out spontaneously, fit for the crew to jump in. They are provided with an inner and an outer skin of vulcanized india-rubber, enclosing air-spaces throughout the entire length, divided into many separate compartments. These boats do not discharge their water, but their floating powers are so great that that quality is not of much importance, and might readily be added. Mr. Berthon has constructed several, one fit to carry a hundred men in any sea, at his own expense. During one of his exhibitions I asked that gentleman if he had laid his plans before the Board of Admiralty. "O yes," he replied, "and the answer I got was, that the Royal Navy was not allowed to carry life-boats, because all the men would desert in them;" they referred him to the merchant service. The shipowners were applied to, and told him that they would use them if compelled to do so by Act of Parliament, but not otherwise, unless he could build them cheaper than their ordinary boats; also that it was not the custom in the merchant service to make any preparations for the mere saving of life, unless compelled to do so by the legislature. Mr. Berthon's india-rubber skin is of a peculiar kind, made of successive layers of coarse calico cemented with rubber, passed through warm rollers, and afterwards vulcanized in a superior manner. The skin of his large boats is three-quarters of an inch in thickness, and as flexible in proportion as glove-leather.—I am, &c., Henry W. Reveley.

Fixed Watertight Bulkheads.—Sir,—The employment of watertight bulkheads in English ships was introduced by Captain Schenk, in 1792. They were used in 1794 by the late Sir Samuel Bentham, in four ships built on his plans for the Royal Navy. A description of fixed bulkheads will be found in the *Mechanics' Magazine* for 1826. Mr. C. Wye Williams claims the first employment of them in steam ships.—I am, &c., C. F. T. Young.

MEETINGS FOR THE ENSUING WEEK.

Mon......Medical, 8. Clinical Discussion. Cases by the President and others. Paper by Mr. De Meric, "On the Use of Mercury in Syphilis."
Asiatic, 3.
R. United Service Inst., 8½.
Society of Engineers, 7. Adjourned Discussion on Mr. Wesely's paper, "On Arched Roofs."

Tues ...Civil Engineers, 8. Discussion upon "The Hydraulic Lift Graving Dock;" and, time permitting, Mr. R. Price Williams, "On the Maintenance and Renewal of Permanent Way."
Statistical, 8. Mr. Samuel Brown, "On the Statistical Progress of the Kingdom of Italy."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Professor Frankland, "On the non-metallic elements."
Royal Horticultural, 3. Scientific Meeting.

Wed.....Society of Arts, 8. Prof. Leone Levi, "On Deer Forests and Highland Agriculture in relation to the Supply of Meat."
Meteorological, 7.
Geological, 8. 1. Mr. W. Boyd Dawkins, "On the Fossil British Oxen. Part I. *Bos Urus*, Cæsar." 2. Mr. T. M'K. Hughes, "Note on the Junction of the Thanet Sand and the Chalk." 3. Mr. W. Whitaker, "On the Kentish Tertiaries."
London Institution, 7.
R. Society of Literature, 8½.
Archæological Assoc., 8½.

Thurs...Royal, 8½.
Antiquaries, 8½.
Zoological, 4.
Philosophical Club, 6.
Royal Inst., 3. Professor Frankland, "On the non-metallic elements."
Inst. of Naval Architects, 12. Evening Meeting, 7.

Fri ......Royal Inst., 8. Dr. Bence Jones, F.R.S., "On the Existence in the Textures of Animals of a fluorescent substance closely resembling Quinine."
Inst. of Naval Architects, 12. Evening Meeting, 7.

Sat.......Royal Botanic, 3¾.
Royal Inst., 3. Rev. G. Henslow, M.A., "On Structural and Systematic Botany."
Inst. of Naval Architects, 12.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st March*, 1866.

33. Bills—Vaccination.
39. „ Turnpike Roads.
35. „ Public Companies.
42. „ Princess Helena's Annuity.
43. „ Prince Alfred's Annuity.
44. „ Public Libraries Act Amendment.
15. (101 to 114) Railway and Canal, &c., Bills—Board of Trade Reports.
63. (i.) Committee of Selection—Second Report.
0·22. Representation of the People Bills—Bills relating to Parliamentary Representation, dated 12th February, 1852; 16th February, 1854; 28th February, 1859; and 1st March, 1860.

Delivered on 2nd March, 1866.

4. (ii.) Cattle Plague—Order in Council.
15. (115 to 124 and 126 to 132) Railway and Canal, &c., Bills—Board of Trade Reports.
20. East India (Electric Telegraphs)—Return.
22. Ecclesiastical Appeals (Privy Council)—Return.
73. Cattle and Sheep Importation (Ireland)—Orders.
74. Duchy of Cornwall (1865)—Account.
80. Admiralty—Return.

Delivered on 3rd March, 1866.

19. Bills—Court of Chancery (Ireland).
45. „ Entail (Scotland).
15. (133 to 149 and 175) Railway and Canal, &c., Bills—Board of Trade Reports.
25. Sheffield Reservoirs—Report.
59. Army (Hong Kong and Kowloon)—Return.
72. Prisons Act—Letters.
81. Parliamentary Boroughs—Return.

Session, 1865.

442. (A viii.) Poor Rates and Pauperism—Return (A.) (December 1864 and 1865).

Delivered on 5th March, 1866.

51. Revenue Departments and Post-office Packet Service—Estimates.
63. (ii.) Committee of Selection—Third Report.
Manufactures, Commerce, &c.—Reports of Secretaries of Embassy, &c., No. 12.

Session, 1865.

447. Local Taxation Returns—Return.
477. Income Tax (Annual Values, &c.)—Return.

Delivered on 6th March, 1866.

30. Bills—Church Rates Commutation (No. 2).
48. „ Prince Alfred's Annuity—Amended in Committee.
15. (150 to 160, 176, 177, 206 and 207) Railway and Canal, &c., Bills—Board of Trade Reports.
58. Mortality in Troops (China and Japan)—Correspondence.
60. Army (Hong Kong)—Return.
70. Bankruptcy—Return.
84. University and National Education (Ireland)—Memorials.

Delivered on 7th March, 1866.

15. (161 to 174 and 178) Railway and Canal, &c., Bills—Board of Trade Reports.
37. National Debt (Savings Banks and Friendly Societies)—Annual Account.
56. The *Duncan Dunbar* and *Barbadienne*—Report and Evidence made to the Board of Trade.
66. Bradford Reservoirs—Correspondence.
90. Civil Services—Estimate "on Account."
Public General Acts—Caps. III. and IV.

Delivered on 8th March, 1866.

18. Bill—Common Law Courts (Ireland).
46. „ Exchequer Bills and Bonds.
47. „ County Courts.
49. „ Colonial Governors (Retiring Pensions) Act Amendment.
15. (179 to 189) Railway and Canal, &c., Bills—Board of Trade Reports.
68. (I.) Trade and Navigation Accounts (31st January, 1866).
63. (III.) Committee of Selection—Fourth Report.
77. Election Petitions—Returns.
82. Bullion—Return.
85. Small Livings—Memorial.
92. Military Reserve Funds—Accounts.

Session, 1864.

577. (III.) Taxes in Europe—Returns.

Delivered on 9th March, 1866.

52. Bills—Superannuations (Officers, Metropolitan Vestries, and District Boards).
54. „ Capital Punishments within Prisons.
15. (190 to 200) Railway and Canal, &c., Bills—Board of Trade Reports.
33. Navy—Statement of Savings and Deficiencies.
75. Steamers—Report of the Commissioners of Her Majesty's Customs.
91. Education—Return.

Delivered on 10th March, 1866.

55. Bills—Cattle Plague (as amended by the Lords).
56. „ Sheriff Court Houses (Scotland) Act (1860) Amendment.
13. East India (Bhootan)—Further Papers.
15. (201 to 205, and 208 to 212) Railway and Canal, &c., Bills—Board of Trade Reports.
71. Metropolitan Improvements—Statement.
83. Customs' Clerks (London)—Treasury Minute.
97. Devonport Election—Report.
Savings Banks—Returns.
Electoral Returns (1865-66).

Patents.

From Commissioners of Patents' Journal, March 9th.

Grants of Provisional Protection.

Alcoholic liquids—615—H. A. Dufrené.
Artificial heat, obtaining—447—S. Marland, W. H. Smith, & W. Wells.
Billiard cues, clip for fastening tips to—609—J. Hick.
Binocular microscopes—581—P. H. Lealand.
Carriages with folding heads—404—J. Rock, jun.
China and India grasses, treatment of—367—P. A. Godefroy and J. W. Mott.
Confectionery—500—W. and J. W. Wood.
Copying presses—438—C. Arnaud.
Distillers' grains, treatment of—565—R. Milburn and W. H. Baxter.
Driving belts—583—F. L. and C. L. Hancock.
Elastic fabrics—551—N. Legendre.
Electric clocks—549—H. Bright.
Fabrics, producing designs in colour upon—511—J. Greenhalgh.
Fibrous materials for spinning, preparing—559—W. Tongue.
Fibrous substances, rollers for spinning—516—P. Smith, sen.
Fibrous substances, top rollers used in spinning—400—J. Sutcliffe.
Fire-arms, breech-loading—593—S. Rydbeck.
Fountains—544—W. D. Napier.
Gas—444—M. R. Leverson.
Gas and air engines—434—C. D. Abel.
Gas meter indexes—585—J. Thomas.
Gas producers, economizing the heat of—497—W. Clay.
Harvesting and mowing machine, a double-action—528—W. M. Wells.
Hoisting and pressing 476—E. T. Hughes.
Ice, making—613—J. Norman and J. Copeland.
Ice, producing—540—B. W. Richardson.
Inflammatory diseases, vacuum apparatus used in—414—V. T. Junod.
Lace fabrics, cutting—597—C. G. Hill.
Lamps and gas burners—619—R. Clark.
Land, cultivating—567—N. Fisher.
Lathes, &c., used by potters, driving—547—E. Leak.
Linen yarn, preparing—486—C. Mather.
Looms, shuttle motion for—2836—F. Tolhausen.
Metallic plates for printing, production of—449—C. Gilpin.
Metals, casting—611—R. A. Brooman.
Metals, rolling—579—F. C. and C. E. Winby.
Motive power, obtaining—557—J. Parker.
Oil from bituminous substances, making—603—H. Robertson.
Peat fuel—545—J. D. Brunton.
Pocket rules—534—W. R. Lake.
Posts—514—M. A. Muir and J. McIlwham.
Printing—496—P. E. Placet.
Railways—575—G. Haseltine.
Railways, signalling on—587—J. Pickin and R. Bailey.
Railways, signals for—595—W. P. Le'Keux and F. A. Wishart.
Railway trains by signals, protecting—512—J. Smith.
Railway wheels—526—C. E. and F. C. Winby.
Reeds and combs, elastic—555—J. Pass.
Roads and streets—591—J. H. Johnson.
Rotary motion in reciprocating motion, converting—586—H. Will and G. Rice.
Rudders—502—A. H. Linnington.
Ships of war, building—569—J. S. Russell.
Shutters, revolving—601—J. H. Fornhaw.
Skates—2790—F. Tolhausen.
Spirit meter—561—J. F. Hearsey.
Stamping or embossing presses—423—J. Pinches.
Steam boilers, preventing incrustation in—484—P. Ward.
Steam engines—563—T. J. Smith.
Steam engines, a tubular slide valve for—607—J. Trent.
Steam, generating superheated—486—A. V. Newton.
Stop cocks—536—L. Brown, W. Wheeldon, and G. N. W. Thompson.
Surfaces, etching and engraving—571—R. Leake and J. Beckett.
Tan, &c., extracting—617—W. E. Newton.
Textile fabrics—432—R. Wolstenholme and R. G. Rodgers.
Textile fabrics, applying size to—386—J. Townsend.
Trusses—522—G. and D. Hill.
Tubes and hollow cylinders—538—W. Webb.
Tubular boilers—532—H. A. Bonneville.
Valves—504—J. Fletcher.
Vehicles—492—W. E. Gedge.
Water meters—520—T. Kennedy.
Weaving, looms for—542—J. Smalley.

Patents Sealed.

2324. C. T. Burgess.	2398. W. Porter.
2345. F. W. Prince.	2415. A. Bird.
2347. D. and J. Hyam.	2424. A. Schultz.
2350. T. and T. L. G. Bell.	2451. E. Brooke, jun.
2351. G. P. Harding.	2769. J. Johnson.
2368. J. K. Hoyt.	2903. W. E. Newton.
2383. J. C. Broadbent.	2949. O. Sarony.

From Commissioners of Patents' Journal, March 13th.

Patents Sealed.

2352. I. Beamish.	2443. M. Schaffner.
2358. J. Whitehouse.	2444. J. Player.
2360. R. A. Brooman.	2550. R. Tonge.
2362. S. Myers.	2578. J. Cunningham.
2372. W. Esson.	2644. G. Marshall.
2390. I. S. McDougall.	2651. G. A. Ermen.
2392. J. Gillespie.	3066. G. T. Bousfield.
2394. J. H. Johnson.	3305. J. W. Blackman.
2427. P. Spence.	257. F. L. Roux.
2433. G. Davies.	

Patents on which the Stamp Duty of £50 has been Paid.

652. W. Inglis.	667. W. Wood.
770. G. Davies.	673. W. Rossetter.
651. C. H. Lea.	688. W. Smith.
687. J. H. Johnson.	697. W. Young.
779. J. H. Worrall.	674. F. Buser-Kranshaar.
666. H. Wilson.	727. B. Wren.

Patents on which the Stamp Duty of £100 has been Paid.

830. A. Paget.	642. A. Tylor.

Registered Designs.

Perimeter Riding Habit Skirt—February 15—4773—H. Creed and Co., Conduit-street, Bond-street, W.
Safety Bolt and Strike Plate—February 17—4774—W. Parkin, Willenhall.
Dash or Beater for Washing Machines—February 21—4775—Harper Twelvetrees (Limited), Bromley-by-Bow.
Capsule for a Bottle—February 27—4776—W. Gilbey, Oxford-street, W.
Union Coupling Socket—March 7—4777—H. Middleton, Liverpool.
Steam Engine Framing—March 10—4778—W. Inglis, 97, Bridge-street, Manchester.
The Skeleton Glove—March 13—4779—Brett and Whale, 30, Edward-square, Caledonian-road.

Journal of the Society of Arts.

FRIDAY, MARCH 23, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'Clock:—

MARCH 25.—*Passion Week.*—NO MEETING.

APRIL 4.—The Manufacture of Sugar, and the Machinery employed for Colonial and Home Purposes." By N. P. BURGH, Esq.

APRIL 11.—"On the Piracy of Trade Marks." By E. M. UNDERDOWN, Esq., Barrister-at-Law.

ART WORKMANSHIP PRIZES FOR 1866-7.

The Council have decided to enlarge the basis on which artisans may compete for prizes for Art Workmanship, and have passed the following resolutions:—

Any producer will be at liberty to exhibit, either in his own name, or through his workmen, any work or works as specimens of good workmanship in the classes given below, provided that the work or works be accompanied with a statement of the name or names of the artisans who have executed their respective portions; and if the work or works be sufficiently meritorious to deserve them, extra prizes will be given to the artisans who have executed them.

Artisans may, if they think fit, exhibit works executed by them after other designs, in any of the above-mentioned classes. Such works may or may not contain the whole or portions of the prescribed designs, but must be of a similar style and character. Competitors must specify the class in which they exhibit. Extra prizes will be awarded.

The works submitted must be delivered at the Society's House on or before the 22nd December, and will be exhibited at the Society's house, and afterwards at the South Kensington Museum. A selection of the best works will be made and sent to the Paris Exhibition of 1867.

The Classes will be as follows:—

FIRST DIVISION.

WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.

CLASS 1.—Carving in Marble, Stone, or Wood.
CLASS 2.—Repoussé Work in any Metal.
CLASS 3.—Hammered Work, in Iron, Brass, or Copper.
CLASS 4.—Carving in Ivory.
CLASS 5.—Chasing in Bronze.
CLASS 6.—Etching and Engraving on Metal—Niello Work.
CLASS 7.—Enamel Painting on Copper or Gold.
CLASS 8.—Painting on Porcelain.
CLASS 9.—Decorative Painting.
CLASS 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.
CLASS 11.—Cameo Cutting.
CLASS 12.—Engraving on Glass.
CLASS 13.—Wall Mosaics.
CLASS 14.—Gem Engraving.
CLASS 15.—Die Sinking.
CLASS 16.—Glass Blowing.
CLASS 17.—Bookbinding and Leather Work.
CLASS 18.—Embroidery.
CLASS 19.—Illuminating.

SECOND DIVISION.

WORKS TO BE EXECUTED WITHOUT PRESCRIBED DESIGNS.

CLASS 20.—Modelling.
CLASS 21.—Wood Carving.

Except in Classes 1, 2, and 4, the subjects will remain as in the list already issued; but in Classes 1, 2, and 4, other subjects will be given, particulars of which will be duly announced.

NATIONAL PORTRAIT EXHIBITION, 1866.

Season Tickets for this Exhibition are now ready, and may be had at the Society of Arts, on application to the Financial Officer, price £1.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The following remarks have been forwarded to the Committee by Dr. Wylde, the Gresham Professor of Music, who was unable to attend and give evidence:—

It seems to have been the policy of the English Government to encourage the progress of the Arts and Sciences rather through the action of individual patronage than the direct authority of national institutions. Exceptions to this rule, however, have been made in such instances as appear to have outgrown the power of private enterprise to provide for, as in the case of free schools for the people, and Government grants bestowed in aid of art associations. The action of national authority upon our system of free schools has frequently been cited as an evidence of the success attendant upon Governmental institutions. The advancement which art has derived from national patronage in the Royal Academy of Painters and Sculptors is not quite so evident, and as the question is still an open one, the verdict of success or failure is not sufficiently marked to quote as authority. But even this view of partial success fails in application to the Royal Academy of Music, whose decadence and inutility, so far from being ameliorated by Governmental aid, has gradually declined, both in numbers and even its original questionable usefulness, into that effete condition which no longer leaves the verdict of a signal failure in the least doubtful. At the time when the Royal Academy obtained from Government a grant in aid of its funds, the number of students was about 120. The voice of public opinion had already pronounced the institution a failure, and the majority of the musical profession were inimical to its further maintenance. At the present time, and notwithstanding the liberal addition to its funds of the Government grant of £500 per annum, the number of students has diminished to 72, and time has only strengthened the impression that for the promotion of the best interests of high art in music, the Royal Academy has more than failed; for, as a promoter of a school of mere mediocrity, that institution is an absolute stumbling-block in the path of musical progress. The question of how far the best interests of music can be promoted by the establishment of a National Academy for its cultivation, and the propriety of soliciting from Government a grant for this purpose, is now in agitation, and as the committee who are organised for the consideration of this subject have honoured me with a request to lay before them my views concerning a basis on which to found a system of musical education, I proceed in this paper to respond to the demand; in so doing, however, I find it far easier to point to the difficulties which oppose the project of the committee than to aid them in laying for it a successful foundation.

The beneficial effects which music is calculated to exercise upon the progress of civilisation are now universally admitted. It is equally certain also that a growing taste for music manifests itself amongst the people of this country, and a love of the art is on the increase amongst all its ranks, and yet it is a lamentable fact, amounting almost to a national disgrace, that we have no school of English music, and the only academy for its culture, which is under the immediate patronage of Government, and is, moreover, aided by its funds, tends to increase rather than to diminish the discreditable *status* of English music. Under these circumstances it seems to me that the first subject of inquiry should be into the causes of failure in the present system, ere an attempt is made to organize a fresh institution, whose success may be marred by a repetition of past failures.

Assuming that the aid of Government should only be required for the support of popular institutions, which the united action of private individuals fails to reach, we must suppose first, that the musical art in England is in a position to require this aid, and next, that the action of Government in the foundation of a National Academy of Music will be the adequate means of meeting the emergency.

To the superficial thinker the foundation by Government of an institution for the gratuitous education of those who desire to make music their profession, is supposed to be all that is necessary to promote the best interests of the art in this country. That such opinions prevail, not only amongst theorists, but also amongst educated musicians, is shown by the response given at a meeting of the Society of Arts, held some few years since, to a question concerning the best methods of musical education, by an eminent musician of the day, who said that—"All that was necessary to promote the progress of music in this country was for Government to provide an institution, hire good teachers, and make the pupils work, and England would soon produce as good musicians and good music as could be desired." I need scarcely point to the fact that the Royal Academy has attempted all this, and yet, with the best of teachers, such an average amount of talent as the country can produce in its pupils—with the prestige of Royal patronage, and the aid of funds from Government—no such results have been obtained as theorists have anticipated, or the above-quoted opinion promised. The Royal Academy of Music may have succeeded in imparting mechanical precision of execution, and mechanical correctness of form, to its pupils, but its systems have never, in other respects, achieved any of the anticipated results. The art of music has not gained aught by its influence. Its pupils have never, except in rare instances, exceeded the range of mediocrity, while genius, instead of profiting by it, has seceded from it; rare and exceptional talent alone has succeeded in transcending its cramping and mechanical influence, and the voice of popular opinion has pronounced upon it the verdict of unequivocal failure.

Still the success of governmental action in educational and art institutions is urged by way of precedent for the foundation of a National Academy of Music, and the existence of such institutions on the Continent, combined with the alleged superiority of foreign artists and foreign schools of music, is supposed to form a sufficient array of arguments in favour of the projected scheme. In reference to these points, I would respectfully direct the attention of the committee to the following suggestions:—

I do not consider that any analogy exists between the institution of Government schools for the education of the people, or even for the promotion of progress in the arts of painting and sculpture, and the projected National Academy of Music; neither do I consider that the superior excellence of foreign artistes, or that of German and Italian schools of music, is due to the influence of a National Academy system.

In respect to free education for the people, it must be remembered that the subject far exceeds the ability of individuals or even their united action as associations, to deal with, hence the case is one which imperatively demands the organization of national systems. As universal education is recognized to be an indispensable element to the well-being of society, as its benefits include all varieties of intellects, and it may proceed upon certain invariable and general principles, so a universal system is both practicable and successful, and applies to all the varied degrees of intellect upon whom it operates. But music, on the contrary, is an art which can only be successfully taught when it adapts general systems to individual cases; and although it is perfectly possible to teach vocalization to a mass, and instruct any given number of persons to sing or even play in time and tune, a general system can go no further, and never succeeds in developing those fine touches of genius upon the production and culture of which the highest musical excellence depends.

In the Royal Schools of Painting and Sculpture, one of the chief features for the promotion of progress which they afford is their ability to supply to their students the noblest models for study and the finest productions of art for exhibition.

The vast importance of high art models in forming and correcting taste has been universally admitted by the painter and sculptor, but the impossibility of stereotyping the performances of accomplished artistes in music deprives us of the right to draw any analogy between the influence of academical systems in the arts of painting and music.

The Academy constantly supplies the one with this most vital element of instruction, but can only furnish models of musical composition to the other; nevertheless, I consider the necessity equally great in both cases, and believe that a comparison of the crude performances of musical academy students with each other is as injurious to their taste as a study of noble models, selected from the repertoire of all ages, is effective in stimulating the academical student in painting and sculpture to aim at the highest standard of excellence. I consider, then, that the attempt to draw analogies between the academical systems of painting and music only tends to misconception, and may ultimately result in repeating the failures of the past and stereotyping the errors of the present.

Before attempting to define my own views respecting the best methods of musical culture, I must consider one more preliminary feature of the subject, and this is the character of English musical genius.

I have already noticed the fact that a wide-spread and constantly increasing taste for music is becoming manifest in this country. In my Gresham Lectures I have analysed the subject sufficiently to produce in my own mind the conviction that there is abundant evidence in favour of the existence of English musical talent, and I must, therefore, assume as proved the fact that we have the raw material, both in quantity and quality, sufficient to work upon. I now proceed, therefore, to discuss the special methods which I consider necessary for the development of the talent whose existence I claim; and, in doing this, I am bound to confess I am at a loss to find, in any of the vaunted foreign academical systems, the model which I could justly commend to your imitation.

As to the French Academy, its plan of taking young persons upon trial, and at the end of a twelvemonth dismissing them, unless they manifest the required ability, after having deluded them with the flattering prospect of an artistic life—this feature of the system alone would be sufficiently repulsive to condemn it; but, as the results of its greatest successes cannot suffice to commend the French School of Music to this country as a subject for imitation, I do not think it worth while to investigate a theory whose results are so unsatisfactory in practice.

I consider that the peculiar excellence of Italian and German musical art is too intimately connected with local and national characteristics to render it safe to assume that the musical genius which these countries exhibit is due to their academical systems; on the con-

trary, we find that the successes of foreign musical academies are invariably associated with the name of some master mind, whose influence and genius overrules the system itself.

Such was the case with the Paris Conservatoire, which owed so much to the influence of Cherubini, and still more eminently so in the instance of the academy of Leipsic, which was under the sway of the master mind and genius of Mendelssohn. So long as the mastery of such unquestionable talent rules the academy and communicates its own brilliant genius to the formation of systems, they will reflect back its light and identify themselves with the dominant intellect; but, as it is certain that such geniuses will exert their legitimate effect upon art, whether within or without the academy, whilst the success of the academy depends upon their presence, we are able to calculate pretty surely how much we owe to the man and how little to the institution.

With the advancing light of analytical truth, we have begun to discover that the secret of success in human undertakings lies in the "men, not the measures"—since the right men will never advocate the wrong measures—and, as the progress of arts and sciences are no exception to this rule, I should ask for men of genius as teachers rather than measures of system to teach by. Academies of music have been on trial years enough to prove their inadequacy to supply the peculiar demands of musical genius.

Neither Bach, Handel, Haydn, Mozart, Weber, Spohr, nor Mendelssohn owed the cultivation of their genius to the Academy, though each of them, in their degree, have irradiated its cold formalism with their talents. Mara, Catalani, Grisi, Lind, and the brilliant constellation of operatic lights who have graced the European boards, owe their excellence, in part, to their own irrepressible genius, and in part to the careful culture of some deeply-interested teacher—rarely, if ever, to the Academy. As a centre, then, for the general diffusion of musical taste, the Academy may have its place; as a means of developing individual genius, it is not only proved, by precedent, to be powerless, but its tendencies are injurious, because repressive and mediocre.

In considering what elements are necessary for cultivating the highest excellence in musical art, we must first study Nature, and inquire what demands she makes upon art for this purpose. Experience has shown that musical organizations are, for the most part, special and peculiar endowments. Genius is naturally erratic, and clothes her most brilliant gifts with sensitive and unusual forms; and to discover and cultivate these, to adapt systems to individuals, and bend rules to the idiosyncracies of genius, constitutes the chief excellence of the teacher, and the success of his training. Now to expect that any system, laid down for the culture of a mass, shall meet such individual cases as I have represented, would be chimerical; to attempt to cultivate individual musical genius without such a special training would be equally fallacious; while to propose the organization of any system for a large number of persons, that was to provide for all the exceptional cases of talent that might arise amongst them, would be to banish the idea of a systematic institution altogether. The partiality of a discerning teacher might, it is true, overcome this difficulty, by selecting special persons for careful training from the general mass of students. But it must be remembered that such a selection must be at once subversive of academical rules, and, moreover, that no exclusive attention could thus be bestowed on individuals which was not unduly subtracted from the rest.

Again, the mere routine, which usually includes some special branch of musical instruction, and no more, does not, in my judgment, constitute a sufficient foundation for the education of a highly-finished artiste, and I am disposed to believe that much of the lack of English talent of which we complain, is due to the want of those modes of culture which I consider to be absolutely necessary to the perfection of a thoroughly successful musician, vocalist, or composer. Music aims at expressing sentiment, simulating passion, representing emotion; in a word, music is Nature's harmonious interpreter of life, and all that constitututes life; hence I claim that no mere instruction in special branches of musical art is complete without the addition of such an education as will enlarge the intellect, refine the taste, cultivate the imagination, and strengthen the understanding. Mere technical skill is not enough. Special knowledge of instruments, vocalization, rules and methods, are not the only means of developing musical genius; they may produce musical machines, but not such accomplished artistes as will captivate the public mind and control the public taste. Singers, composers, and musicians must be taught that music means something;—that it is human speech in melodious accents, and is as full of ideas, passions, and sentiments as language itself; hence such a system of education as is deemed necessary for the reader, actor, orator, or any person who aims to control the minds of others by the action of his own, is just as emphatically demanded for the musical student.

We constantly find poetic imaginations and sympathetic natures associated with the most unequivocal successes in painting, sculpture, poetry, and architecture. Such arts, in fact, seem to demand such natures as prerequisites, and general education is admitted to be, in their case, an essential polish to the gem of their intellect, and yet we have been accustomed to suppose that no intellectual culture or general education is at all essential to the training of a musician. Teach the performer his instrument, the composer his rules, and the singer her notes, with perhaps the addition of a graceful elocutionary mode of pronouncing her words, and a musical education is complete; but I affirm that whilst nature makes the broad demand of general intellectual culture in every other department of art, music alone should not be the exception; and I attribute the vast amount of mediocrity and merely mechanical attainment with which the musical profession is flooded, to the neglect of those refining processes of general education which constitute such an essential element in artistic success. Another of the most imperative necessities for the perfection of high art training I consider to be, in the case of the painter, the opportunity to study the finest productions of his art; with the musical student, to hear, as well as study, the most perfect performances of music. Models, both for comparison and imitation are, in my judgment, as necessary in the one case as the other, and a correct taste and finished style will never be perfected in the student of music who has not the constant advantages of listening to the finest specimens of both that the age can produce.

As it seems to me that the success or failure of a National Academy of Music, organised for the purpose of promoting the highest interests of the art, must admit, as essential features of the system, the elements of instruction I have named, the inquiry naturally arises as to the possibility of their being inaugurated in an academical system.

Can masters in sufficient number be procured who are analytical enough to discover the latent and peculiar germs of talent in individuals, patient enough to cultivate them specially, and permitted by the rules of the institution to devote as much time and care to the culture of that talent as if the pupil were the master's own individual speculation? In what mode could a national institution furnish its students with the opportunities for hearing and studying those models of artistic excellence which I claim to be so essential a feature in forming the taste and style of the musical tyro? Could a national academy of music combine with its special elements of instruction such a broad and general system of intellectual culture as would promote the development of musical genius rather than musical machinery only?

And, finally, could the Academy obtain the services of a thoroughly practical, not amateur or theoretical musician merely, whose general superintendence of the whole would infuse vitality into its formulæ, and stimulate the machinery of a set system into life and vigour, by his own interest and genius?

Let it be remembered that the obstacles to the possible success of any future undertaking which I have suggested, are precisely those which have hindered the success of academical systems in the past; and if I appear to have laid down a basis for a musical education in requirements of too numerous or complicated a character to be complied with, I must add that their success in a vast array of individual cases is already proved, whilst their disregard might result in repeating the pitiable failure of the present Royal Academy, besides unjustly wasting the public money in an uncertain and costly experiment.

If I might presume to offer an opinion concerning the best mode of appropriating Government funds for the promotion of the art of music in this country, I should suggest the institution of a national opera, and the organisation of a system for the exhibition and encouragement of already well-trained native talent in music.

I consider that the lack of English musical genius in the field of European competition does not proceed so much from inefficient training as from a servile and conventional spirit of admiration for foreign talent which prevades all classes of English society. English composers, singers, and players find little or no demand for their services; and, unable to endure a perpetual and unsuccessful struggle with their fashionable foreign rivals, are compelled to subside into that insignificance which, beginning with discouragement in the individuals, ends in the mediocrity of the whole. The *entrepreneurs* of operas and concerts, compelled, in obedience to the arbitrary dictum of fashion, to import foreign artistes at enormous rates, find themselves unable to supply the people with the best music at accessible prices, hence the English public are deprived of the vast stimulus to popular good taste which a universal diffusion of good music would promote.

The enjoyment of fine classical music, and the finished performances of high art in the opera and concert room, are, in general, expensive luxuries, attainable only by the rich, and the idea of popularising good music and stimulating English musicians to enter the field of foreign competition by Government patronage and national encouragement, never seems to be taken into consideration as a means of improving popular taste and promoting the formation of an English school of music, and yet to me it seems a far more feasible plan than for Government to undertake the doubtful and expensive work of educating artists, whose easiest road to popular favour may at last be found to be the assumption of a foreign name, and whose talents, if rare, will at once place them out of the reach of the very populace whom it is desired to influence.

I believe that the office of the Academy is to impart general information through general systems, and that these, though adapted to the masses, never avail in the peculiar conditions of special genius, and so, as it is special genius that is required in those who are to be so educated as to become exemplars to the populace of high art in music, I conclude that academical systems are unsuited to that purpose.

If the idea arrived at by the committee investigating this subject is merely a gratuitous or cheap system of imparting musical instruction, then the discreditable mediocrity of the present Royal Academy might satisfy the demand; if, on the contrary, the attainment of great and distinguishing musical ability be the goal desired, special training, with all the adjuncts I have described, is the only mode I can point out for reaching the desired end; and for such methods of instruction I can see no feasible mode of organising arrangements on a large scale, or, in fact, in any other direction than the mutual interests which subsist between the pupil and teacher render desirable.

If the aim of the committee be the promotion of a genuine English school of music, I would again urge that the best mode of attaining so desirable an end will be reached best through a national opera, and such opportunities for exhibiting and encouraging native talent as will stimulate composers to write, and artistes to educate themselves for the highest ranks of their profession; that this can ever be obtained by the academical system, which applies only to the instruction of the mass, I can no more believe than I can realise that a universal medicament can apply to "all diseases which flesh is heir to."

A successful national Academy of Music demands too much for the work of organisation. Individual and special instruction for special and peculiar cases would require masters the most gifted and numerous. Educational systems which tended to high intellectual culture, however essential to the individual, would be a vast and expensive undertaking for the mass. The opportunity for hearing, as well as studying, high art models, if undertaken for a whole mass of students, would necessitate their connection with a model opera, on precisely the same principle as the Royal Academy students of painting and sculpture are supplied with models as the imperative condition of their system of tuition.

I can easily understand how readily such conditions have been and can be complied with in the mutually interested relationships of master and pupil in private and individual undertakings, but I can propose no method of inaugurating such modes of tuition in the Academy, although without them the chances are great that a National Academy of Music would be a national disgrace, or take rank only as a promoter of that mediocrity from which aspiring talent of a high order will inevitably shrink away, and seek in private teachers for those more elaborate and specially adapted methods of culture whose study and observance grow out of an understanding of the fundamental principles of art, and whose application forms the basis of a true and successful system of "Musical Education."

Sixteenth Ordinary Meeting.

Wednesday, March 21st, 1866; Charles Neate, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Alison, A., 41, York-terrace, Regent's-park, N.W.
Bush, William John, 30, Liverpool-street, E.C.
Davis, E. J., Globe Wharf, Mile-end, E.
Fentum, Martin, 85, New Bond-street, W.

The following candidates were balloted for, and duly elected members of the Society:—

Abbott, Joseph William, 163, New Bond-street, W.
Brown, Allan McLaren, 269, Camden-road North, N., and Marlee, Blairgowrie, Perthshire.
Condy, Henry Bollman, Devonshire House, Battersea, S.W.
Lomax, J. J., Proprietary School, Hereford.
Stepney, Cowell, 9, Bolton-street, W.
Tabraham, Robert, Bellevue House, London-road, Worcester.
Walker, Robert, 10a, King's Arms-yard, Moorgate-street, E.C.
White, Henry Nathaniel, 83, Albion-road, Dalston, N.E.

The Paper read was—

ON DEER FORESTS AND HIGHLAND AGRICULTURE IN RELATION TO THE SUPPLY OF FOOD.

By Professor Leone Levi.

At a time when a fatal disease is destroying so rapidly and so completely a large portion of our cattle, reducing greatly the supply of meat throughout the

country, our attention is necessarily called to the extent and condition of our pasture land, and to the mode of employment of the soil within our limited territory. Meat enters largely into British economics; it constitutes the principal element in the food of the people; and it has even been said that the working power of any population is just in relation to the proportion of meat usually consumed; that, in fact, the superiority of an English over a French workman is owing to the greater quantity of beef he eats. How fortunate it is that with a liberal commercial policy we can turn our eyes to foreign countries for the supply of any commodity we may be wanting, and that boundless stores of produce and abundance of horned beasts are ready to be sent to our shores. Within the last ten years, from 1856 to 1865 inclusive, we imported not less than 1,396,401 cattle, 3,531,143 sheep, and 361,606 pigs, the imports having increased, year by year, at an enormous rate. What proportion the supply of foreign cattle may bear to the total consumption in this country we cannot say, there being no statistics as yet on the subject. It is calculated, however, that about 1,500,000 cattle of home produce are annually killed, and probably a fifth more comes from foreign countries. In the year 1865 our imports exceeded 280,000 cattle, and 984,000 sheep, representing some 200,000,000 lbs. of meat, which at 6d. gives a value of £5,000,000 against a loss of probably half of this amount from the cattle disease. This is certainly consolatory and reassuring, whatever may be the future before us. It is, nevertheless, our bounden duty to develop as much as possible our own resources, to enlarge our own capabilities, and, above all, to neglect no source of wealth which a gracious Providence may have placed within our reach. There is this peculiarity, moreover, as regards the importation of animal food, that the carriage from Poland or the interior of Prussia or Austria, from whence the cattle are brought, is enormous; that the long and weary road through which they have to travel must greatly diminish their weight, and subject them to grievous distempers; and that when at last they crowd to the shipping ports, and are stowed on board a ship, they stand in danger of being suffocated. With great reason, therefore, the Chairman of the Council, Mr. Hawes, in his opening address, said, "It appears, therefore, looking to these facts, that greater attention should be devoted to the production, in these islands, of animal food than to that of vegetable food; and I am assured by those on whose knowledge and practical skill I can rely, that although to increase materially our supply of cattle and sheep would require some change in the present mode of cultivating our land, still that the land so cultivated would employ more agricultural labour, more capital in farming, and be more profitable than under the present system, which appropriates so large a portion of our soil to the cultivation of cereals, which can be produced cheaper abroad, to the neglect of the breeding of sheep and cattle, which can only be produced in the numbers we require at home."

Looking at the state of agriculture generally in the United Kingdom, we might, indeed, expect that with the energy that distinguishes the people of this realm, with the eagerness for wealth generally prevailing, and with the absolute necessity of using our land to the very utmost of its power, not an inch of ground would remain in any part of the United Kingdom, at all capable of cultivation, or fit for pasture, that would not be either put under the plough or well stocked with cattle or sheep, but such is not the case.. During the Continental war, at the commencement of this century, great stimulus was given to the cultivation of land by artificial legislation, but with an incentive so ephemeral the progress could not be permanent. Since the peace of 1815 a great deal has undoubtedly been done. Much land has been reclaimed, many a tract, formerly barren and neglected, has been rendered fruitful and even luxuriant, and the rate of production in not a few counties has immensely increased. Scotland and Ireland have, in a great measure, participated in this improvement, and there is no doubt but that agriculture, by the introduction of the use of guano, a better system of drainage, the extension of chemical knowledge, and the improvement of agricultural mechanics, has made, and is making, very rapid progress. There are, however, not a few most difficult problems yet to be solved, and many improvements are yet to be introduced, before we can obtain all the production our land is capable of affording. Much has been written on the relative advantages and disadvantages of large and small holdings, of cultivated and pasture land, on the economic bearings of forests, and much more on the effects of the laws of entail and primogeniture on the proprietorship of land, but who has attempted to grapple with questions of such momentous importance, in many cases touching directly the very basis of society and the foundation of our laws of property? Few indeed would care to enter into such questions so long as they are considered speculatively or theoretically, but it is widely different when they produce practical grievances, and we see direct injuries resulting from them. If, then, it can be shown that a certain system of agriculture in the Highlands of Scotland, and certain special laws with reference to land, have the effect of diminishing the production of food; if it can be demonstrated that, at this very juncture, when our cattle are being decimated, there is an enormous extent of land within our own territory which might be available for pasture, but is now practically abandoned and uncultivated, we must not be deterred from entering into a careful examination of the causes which may still hinder our agricultural progress. What, in fact, might have been theoretic or abstract heretofore, may have become of momentous and practical interest at this moment.

It is, therefore, of the utmost importance to direct our attention to the system of agriculture which obtains in the Highlands and Islands of Scotland, and we may with great advantage pry a little into that monster abuse of later growth, the extension of deer forests, which threaten to bring Scotland back into a state of aboriginal wilderness. However strange it may appear, it is extremely difficult to define the limits of the Highlands of Scotland. At one time their geographical and physical limits were well marked. A mountainous region, the prevalence of the Gaelic tongue, the use of the kilt, and the general tendency of the people to certain popular exercises and amusements, were of themselves sufficient to distinguish the Highlands from other portions of the country. But in late years English literature has been rapidly taking the place of the Gaelic; steady habits of industry are being preferred to the more uncertain life of military adventure; clanship has been practically abolished; and if it were not that the mountains are still rugged and wild, and that the straths, lochs, and waterfalls are as picturesque as ever they were, we might say that the glory of the romantic Highlands and Highlanders had for ever departed. In reality four counties of Scotland only can be said to be purely Highland, viz., Argyll, Inverness, Ross and Cromarty, and Sutherland. These do not comprise the whole of the Highlands, since many parishes in Aberdeen, Caithness, Elginshire, Perthshire, &c., are decidedly Highlands; but we must take whole counties if we wish to try their real condition, and we must not mix up low land with high land. The principal characteristics of these counties are well known. They contain abundance of gneiss, quartz rock, mica slate, and granite, with very little or no coal formation, or clay slate, or red sandstone; they are distinguished for the great elevation of land, for a severe and uncertain climate, and for a larger quantity of rain usually falling than in any other country. It would be quite erroneous, however, to imagine that all the Highlands are labouring under such difficulties. Certain portions of the country are doubtless unfit for

any production; but the great bulk of the Highlands is in no wise so badly situated, and there the land is nearly as productive as in any other part of the kingdom.

A striking feature of these Highlands is the extreme paucity of population. In this country we glory in our large population, we are thankful for its rapid increase, and count it as one of the most certain evidences of economic progress. But there there has been a constant retrogression in this respect. Many of the old inhabitants, who, with their families, had for generations lived in the country, have been ruthlessly driven out,—here to give place to the sheep, there to convert the land into deer forests, and elsewhere because the landowner decided in joining farm to farm, and pendicle to pendicle. Such as remained have been, and are, to a great extent, looked upon more as obnoxious burdens than as useful producers. In the four Highland counties already named there are at present only twenty-two persons per square mile, in Sutherlandshire there being only thirteen, whilst England, taking the whole country together, has 344 per square mile. No doubt in some agricultural counties of England the population has not been increasing; yet nowhere do we see such a desolation. You may, in fact, walk miles and miles through the Highlands without seeing a cottage. A "toon," as a farm-steading is there called, is quite a rarity. In very many places no stranger is even permitted to settle in villages, and no land would be given for the erection of houses and churches. Can any system be right or good that leads to such results? Is it expedient, is it right, may we ask, to throw impediments to the settlement of human beings in such extensive tracts of country? Does the right of property go so far as to have unlimited power to displace whole populations, and to shut out the land to every new comer? Paraguay under Francia, was no more shut up than are many portions of the Highlands under the owners of the soil this very day. But it is said there is no food for them; the land is barren and rocky; it cannot sustain a large population. This is true to a certain extent, but, if I am not mistaken, the plan of depopulating the Highlands and destroying the crofters, has been forced and carried to a point inimical to the best interests of the country.

In the system of agriculture in the Highands, the prominent points are—the enlargement of farms obtained by the constant amalgamation of small holdings, the tenants having been in many cases suddenly dispossessed and compelled either to emigrate or to crowd on some piece of land on the coast, whilst the remaining holders have been rendered as uncomfortable as possible by high rents and onerous conditions; the conversion of tillage land into sheep-walks with the same effect acting still more oppressively on the tenants, and lastly the enclosure of all lands which admit of being let out for shooting into forests, whether they might or might not be otherwise productive of food. That in certain cases it is more advantageous to produce on a large than on a small scale is quite evident. A manufacture carried on on a large scale within one large factory admits of greater division of labour, greater use of machinery, greater economy in superintendence, and greater investment of capital. And so a large farm may admit of a more extended use of agricultural machinery, prevent much waste in hedges, and render labour more efficient. But there are certain conditions, without which all such advantages can never be realised. It is not all kinds of land that will admit of the use of machinery, or of being worked on one uniform system. On the Highlands, where the land is so uneven, where one portion differs so much from another, and where machinery is not so much available, farming on a large scale cannot universally answer. It is possible that in some cases the incorporation may have proved beneficial, but in many I am sure it must prove a disappointment to the landowner, the rent from a large farm not being equivalent to the aggregate of small rents derived from many separate holdings. As to the effect of such amalgamation on the production of food, it is a grave question whether a number of small farmers anxious to draw from the land as much as it is capable of rendering would not, by assiduous care, succeed much better than a large farmer working by means of hired labourers. We have no statistics to show the progress made in such amalgamation of farms from year to year, but the process is going on extensively even at this moment. It would be erroneous indeed to imagine that there are no small farms in the Highlands. The grave difficulty arises from the fact that whilst in some parts of the country the land is divided into very large farms, in other parts it is split up into far too small holdings. According to the agricultural statistics prepared by the Highland Agricultural Society for 1855 to 1857, there were then as many as 16,000 occupiers in the four counties of Argyll, Ross, Inverness, and Sutherland, at a rental below £20, and 3,000 occupiers at rents at or above £20; the total acreage held by these 19,000 occupiers being 280,000 acres, or an average of 14 acres per occupier. The amount of rental given for the whole was £640,000, which gives an average of £33 per occupier, a sum scarcely sufficient for rendering the holder independent of extraneous sources of income. That the condition of the small holders might be much improved, were the proprietors willing to invest more capital and give greater encouragement to improvements, there is no doubt. As it is, the position of such occupiers is very precarious, and great temptation, no doubt, is afforded to the landowners to remove them from a false position. What is required, however, is first that no forced enlargement be made without considering the case of the occupier, and that when from any cause an enlargement is practicable, the cultivator shall not be left destitute and compelled to emigrate to foreign lands, but shall rather be allowed to rent any other tracts of land of competent size within the country, for which he may have the means of competing. A still more marked feature of Highland agriculture consists in the conversion of arable land into sheep-walks. This has been a favourite plan of late years; and ever since, under Mr. Loch's agency, the Sutherlandshire tenants were driven from their soil, their huts being burnt before their own eyes, the sheep and the shepherd have taken the place of tillage land and industrious cottiers. We may well imagine that land which produced little or no rent under cultivation, might be made more profitable if let out as sheep-walks, since the expense of maintenance of labour is considerably less. But the fact that the landowner gets more rent is not an evidence that the land produces more food in one way than in another. It only follows from this—that what was before divided among many is now monopolised by the few. Great difference of opinion exists as to the effects of such clearances. Not a few regard the change as decidedly beneficial. Under the old system, it is said, the people, collected in the glens and valleys between the mountains, produced but little corn, and were mainly dependent upon cattle. There was a redundant population; rents were trifling, and no capital was invested for the improvement of land. By the overthrow of the cottier system, the clearing of the glens, and the introduction of sheep farms, extensive mountain land, formerly useless, has been made productive, the production of food has greatly increased, and the inhabitants, formerly most indolent, have become industrious and active. This is, however, evidently far too bright a view of the real state of the Highlands. At what expense have these clearances been made? Was the displacement of the population an easy task? Is the condition of the population in the places where they have been thrown, even at this moment, at all satisfactory? Allowing that more mutton and more wool are produced in these Highlands under the present system, are cattle as abundant? What chances are there of developing the resources of the country where there is no population? Whence these periodical lamentations, whence this discontent,

whence this poverty if the Highlands were now as fruitful as the apologists for the present system would represent them to be?* We doubt very much whether, however the owners of land may have benefited, the country at large has substantially improved.

The talented editor of *Good Words*, in his "Reminiscences of a Highland Parish," gives us a most practical illustration of the change thus operated:—"When tacksmen were swept away to make room for the large sheepfarms, and when the remnants of the people flocked from their empty glens to occupy houses in wretched villages near the seashore by way of becoming fishers, often where no fish could be caught, the result has been that the 'parish,' for example, which once had a population of 2,200 souls, and received only £11 per annum from the public (Church) Fund for the support of the poor, expends now, under the Poor-law, upwards of £600 annually, with a population diminished by one-half, and poverty increased in a greater ratio. The temptation to create large sheepfarms has no doubt been very great. Rents are increased, and more easily collected; outlays are fewer and less expensive than upon houses. But should more rent be the highest, the noblest object of a proprietor? Are human beings to be treated like so many things used in manufacturing? Are no sacrifices to be demanded for their good and happiness? Granting even, for the sake of argument, that profit, in the shape of obtaining more money, will be found in the long run to measure what is best for the people, as well as for the landlord, yet will not the converse of this be equally true, that the good and happiness of the people will in the long run be found the most profitable? The proprietors, we are glad to hear, are beginning to think that if a middle-class tenantry, with small arable farms of a rental of £20 to £100 were again introduced in the Highlands, the result would be increased rents; better still, the huge glens, along whose rich straths no sound is now heard for twenty or thirty miles but the bleat of sheep and the bark of dogs, would be tenanted, as of yore, by a comfortable and happy peasantry."

This is not the place for poetry or romance, yet when we hear of whole populations having been swept away from the soil, and of whole territories having for ever parted company with their natural friends and protectors, it is difficult to refrain our sentiments of sympathy. Well might Professor Blackie, a warm advocate of the Highlands, in visiting once more that wild solitude of Sutherlandshire, burst forth with patriotic fervour in the following pathetic verses:—

Bonnie Strathnaver! Sutherland's pride!
With thy streams softly flowing, and mead spreading wide;
Bonnie Strathnaver, where now are the men,
That peopled with gladness thy green-mantled glen,
Bonnie Strathnaver?

Bonnie Strathnaver! Sutherland's pride!
Sweet is the breath of the birks on thy side;
But where is the blue smoke that curl'd from thy glen,
When thy lone hills were dappled with dwellings of men,
Bonnie Strathnaver?

Bonnie Strathnaver! O fearful to tell,
Are the harsh deeds once done in thy bonnie green dell!
When to the rocks of the cold blastful ocean were driven,
The men on thy green turfy walks who had thriven,
Bonnie Strathnaver!

When the lusty-thewed lad and the light-tripping maid,
Looked their last on the hills where their infancy strayed;
When the grey drooping sire and the old hirpling dame,
Were chased from their hearths by the fierce spreading flame,
Bonnie Strathnaver!

Bonnie Strathnaver! Sutherland's pride!
Wide is the ruin that's spread on thy side;
The bramble now climbs o'er the old ruined wall,
And the green fern is rank in the tenantless hall
Of bonnie Strathnaver!

Bonnie Strathnaver! Sutherland's pride!
Loud is the baa of the sheep on thy side;
But the pipe and the song, and the dance are no more,
And gone the brave clansmen that trod thy green floor,
Bonnie Strathnaver!

Bonnie Strathnaver! Sutherland's pride!
Vain are the tears that I weep on thy side;
The praise of the bard is the meed of the glen,
But where is the charm that can bring back the men
To bonnie Strathnaver?

By far the most important point, however, in relation to the agriculture of the Highlands is the great extension of forests. In England, we are constantly hearing of the reclaiming of land, and of the disafforesting of forests, the Legislature passing every year Acts authorising the enclosure of large extents of land; and we need it all, seeing that the population increases so rapidly. But in Scotland it is quite different, and if not arrested in time there is danger that the greater part of that country—the northern part at least—may become once more a great wild desert. The landed proprietors have been studying of late the newest system of agricultural economics, certainly not that taught either by Adam Smith or Stuart Mill, Say, or Michel Chevalier. They found out that land left wild and uncultivated, land dedicated to deer and rabbits, pays better than land used as sheepwalks or dedicated to cultivation. And the landowners have acted on this new discovery by at once turning out the sheep as they once turned out the men from their estates and welcoming the new tenants—the wild beasts and the feathered birds. It is estimated that there are in Scotland upwards of 2,000,000 acres of forests; and one can walk from the Earl of Dalhousie's estates in Forfarshire to John o'Groat's, without ever leaving forest land. I might mention the forests of Alyth, Athol, and Dummie, in Perthshire; of Balnagown and Lewis, in Ross-shire; of Beyn and Glenavon, in Banffshire; of Mar and Birse, in Aberdeenshire; of Gaick, in Inverness-shire; and of Platers, in Forfarshire. In many of these the fox, the wild cat, the marten, the polecat, the weasel, and the Alpine hare are common; whilst the rabbit, the squirrel, and the rat have lately made their way into the country. Immense tracts of land, much of which is described in the statistical account of Scotland as having a "pasturage in richness and extent of very superior description," are thus shut out from all cultivation and improvement, and are solely devoted to the sport of a few persons for a very brief period of the year. Can we afford such a great waste? Can it be defended by any economical or social law? Can anything be put forth in behalf of a system so destructive? Who can say how many cattle and how many sheep could be maintained were such forests profitably used? It has been gravely asserted that there is only a difference in the kind of meat produced. But who will compare beef or mutton with venison? Who eats venison as food? Beef is the sustenance of the many; venison is the luxury of the few. Beef feeds and strengthens the labourer for his hard daily toil; venison may please the palate of the noble; but after having ornamented the rich man's table, it is usually wasted by the servants. It may be true that venison has a price in the market, but trace it to its destinies, and tell me whether it can be counted as food for the people.

* As an evidence of the forlorn condition of the Highland population at the present time, we may notice the state of education, especially in the four Highland counties. From the detailed returns of the Registrar of Births, Deaths, and Marriages for 1861, it appears that the number of persons signing the marriage register with their marks, because they could not write their own names, was in round numbers 30 per cent. of the men and 46 per cent. of the women. This is considerably in excess of other portions of Scotland, where the proportion so signing was only 9 per cent. of the men and 20 per cent. of the women, and even worse than in England, where the proportion is 23 and 33 per cent. respectively. The Highland Improvement Society and the Gaelic Society, an auxiliary of which is established in London, have done much to improve education in the Highlands and Islands by establishing schools and providing teachers. But their efforts are crippled for want of sufficient support, and certainly they deserve the aid of all who take an interest in the education of the people.

Moreover, let me remind you that the venison usually eaten is not the produce of the forest at all. It is the fallow deer, reared and fattened in the English gentleman's park. The red deer is seldom if ever seen in the London market. It is not fit for human food, especially in such ill condition as it comes. Grouse, partridges, and pheasants are, no doubt, sold largely, but the middle classes do not take them, and the high cost puts them quite out of reach.

It is sometimes said that a deer forest will employ as many gamekeepers as a sheep-farm will employ shepherds. But the great difference is that the shepherd is a productive labourer and the gamekeeper is not. A policeman may, with greater propriety, be considered as a productive labourer than a gamekeeper, since the former, by preserving peace and security, promotes the production of real wealth, whilst the latter protects land devoted to no useful purpose. Much expenditure is indeed incurred in the maintenance of such forests. But what of that? It is all the worse if what is got from them comes short of the only condition of utility —an increase of wealth. It is true that in some cases, whilst the fashion lasts, a higher rent may be got from a forest than from either tillage land or sheep-farms, but that does not necessarily represent production. Rent so obtained is nothing more than a transfer of money from one pocket into another. It is no more wealth produced than the money gained by a great singer or musician as the price of a passing enjoyment.

The great benefit of such forests in promoting healthy exercise should not be underrated. When August comes we do long for a little fresh air, and for a freer and less conventional life. But for that timely invigoration of our careworn and hard-toiled minds and bodies the duration of our active life would be considerably shortened. And nowhere can we go more likely to quicken our forces than to the mountains and glens, to the forests and moorlands of the Highlands of Scotland. Nor is it of little advantage to Scotland to attract into her midst the Queen and the Princes of the Royal House, nobles and millionaires, who transfer thither for a season their large establishments, scattering wherever they go a profusion of wealth. Who can tell how much is thus left behind among that thrifty population? But even this is not production, but simply a transfer of wealth northward. Economically, there is only one rule for ascertaining the real value of forests,—and it is whether we do extract the most out of a given place. We cannot take the pleasure of the sport as tantamount to the production of wealth. The world is wide enough. There are enough of places wild and desolate to satisfy the keenest tourist, pedestrian, or sportsman; and we shall not envy Sweden, Norway, or the Black Forest, on the Rhine, if they take away some of the wealth produced in this country, provided we can thereby use our own land to better purposes.

In olden times, the keeping of a forest was quite a royal privilege. It is said that William the Conqueror laid waste a country of about 30 miles in extent, driving out all the inhabitants, destroying all their dwellings, and not sparing even their churches, in order to form what is called the New Forest. If that act was greatly reprobated in a king, how much more should we reprobate similar acts when committed by private individuals? I imagine, however, that the landowners have not the right to use their property in any manner they please. The owner of land stands rather in the character of a trustee for the entire population, and they have a right to expect that the land placed under the care and guardianship of such owner shall be used and not abused, shall be employed and not wasted. If, then, it can be proved that land, otherwise capable of cultivation, or of being used for the rearing of cattle, or the maintenance of sheep, is unwarrantably converted, for the sake of gain, into forest, has not the public a right to interfere? It seems to me that in such a case there is a clear public interest which justifies interference, and supplies a just reason why the landowner should not be allowed to do what he likes with his own. But it is asked if the principle of interference is to be applied to moors, why not to fields; if to fields, why not to gardens, and if to the great, why not to the small? To justify the interference of the State with the rights of property, a very clear and cogent cause must certainly be proved to exist, but it is by no means a rare circumstance when the Government is called upon to limit the rights of property. It is done constantly in the passing of a railway bill, and in the case of the erection of some public building. The public good must be supreme. Let it be established that the land now wasted for forests is absolutely wanted for productive purposes, and the Legislature acquires an undoubted right of interdicting the use of the same for any other object whatever. Mr. John Stuart Mill, in his admirable chapter on "Property in Land," says:—"A man whom, though only one among millions, the law permits to hold thousands of acres as his single share, is not entitled to think that all this is given to him to use and abuse, and deal with as if it concerned nobody but himself. The rents or profits which he can obtain from it are at his sole disposal; but with regard to the land, in everything which he does with it, and in everything which he abstains from doing, he is morally bound, and should, whenever the case admits, be legally compelled, to make his interest and pleasure consistent with the public good. The species at large still retains, of its original claim to the soil of the planet which it inhabits, as much as is compatible with the progress for which it has parted with the remainder."

We must remember, moreover, that the existence of such forests is itself the fruit of a special legislation for the protection of game. The proper meaning of the word forest is "a wild uncultivated tract of land with wood." But at law its meaning is widely stretched by stating it to be "A certain territory of woody grounds and *fruitful pasture*, privileged for wild beast and fowl of forest chase and warren to rest and abide in the safe protection of the King for his pleasure." The game laws are, in fact, the result of the forest laws. As Blackstone said, "From this root has sprung a bastard slip, known by the name of game law, now arrived to, and wantoning in, its highest vigour, both founded upon the unreasonable notion of permanent property in wild creatures, and both productive of the same tyranny to the commons, but with this difference, that the forest laws established one mighty hunter throughout the land, the game laws have raised a little Nimrod in every manor." No one would sanction an unlimited right to enter in search of game the estates of another, but how shall we justify the dedication by the owners themselves of excellent land to the maintenance of game? Nor should we forget that the filling of such estates as preserves with animals *feræ naturæ*, which are in great demand, constitutes a fruitful source of offences which all the laws in force against poaching cannot prevent. The question of the game law is of wider reach than that of forests, since it interferes with cultivation generally. We know how the interest of farmers is damaged by it. We know how the preservation of game interferes with the keeping of a large amount of stock.

Enough, however, has been said on the subject generally. The whole question seems to me one of extreme interest and importance. Here we have some millions of acres of land literally wasted, large portions of which might certainly be used for profitable purposes. The cultivated portion is, in some parts of the country, divided into large farms, not in all cases the best method for securing the greatest amount of produce, and in other parts into holdings far too small to afford sufficient means of livelihood to the crofters. Sheep-walks of extreme sizes have taken the place of cultivation in whole counties; and deer forests are now

being preferred to either, simply because they bring more money to the landowners. But what gives a peculiar interest to the whole, is the conflict which has been going on between the small number of proprietors in these Highland counties and the whole population.

Looking back to these clearances, fraught with so much injury to the occupiers of the soil, it is impossible not to come to the conviction that there ought to be some laws shielding such occupiers from such grievous injustice, and from dealings often so harsh and unmerciful practised against them by the landowners. Even supposing such acts were justified by economical requirements, that would not be a sufficient answer to the higher law of justice and humanity which ought to bind man to man in every relation of life. There is a limit even to the principle of "*Laissez faire, laissez aller.*" And, lover as I am of that science which has done so much to place the national welfare on a solid basis, I cannot but think that the utmost caution is needed in acting on some of its dictates, and that we should always endeavour to modify any temporary inconvenience they might produce by the exercise of prudence and forbearance, and above all, by careful regard to the remedying influence of time.

In Ireland the continuous evictions from land, in order to extinguish the small holdings of one to five acres have been the cause of great discontent and serious disorders. Though upwards of twenty years have elapsed since the evicted tenants were driven to find a more hospitable soil in a foreign land, the seed of rancour is not yet removed, and we see it bearing fruits in the ill-fated "Fenianism." In Scotland the people have been more submissive and reconciled, and yet more independent and reasonable; but the evil has been inflicted just the same, and we must take care that a total disregard of the relation which should bind together landlord and tenant does not lead to serious misfortunes. The Highlanders are constantly advised to emigrate, and all kinds of encouragements are given them to expatriate themselves. Is it good for the country that the robust Highlanders should continue to depart from these shores? I would fain hope that a better system of agriculture, and a more kindly and considerate interest for the education and welfare of the people, will lead to better results; as I am fully convinced that the interest and prosperity of the country are bound up with the happiness, contentment, and good settlement of every one of its inhabitants.

The conclusions that I arrive at on the whole question may be summed up in the following propositions:—

1. That there is reason to believe that the process of conversion of tillage land into sheep-walks, and the consequent extinction of the crofter system, with the removal of the native population from the Highlands of Scotland, has been carried out to an excess injurious to the best interests of the country.

2. That since large tracts of land capable of tillage exist in different parts of the country either altogether neglected or used as sheepwalks, which might be rendered more productive were it let out in small farms, it is greatly to be desired that the same should be utilized, especially with a view to an increased number of cattle, and for the winter keeping of sheep.

3. That, having regard to the exceedingly small and sparse population in the Highlands, side by side with the alleged over-crowding of some parts, especially on the sea-coasts, it would appear most important that advantage be taken of any arable land for reinstating an industrial population in the heart of the country.

4. That, with a large population to feed in Great Britain, and great material interests to subserve, the maintenance, and far more, the extension, of forest land and deer forests is incompatible with, and most inimical to, the welfare of the people, in so far especially as they keep out of cultivation or of pasture any portion of land capable of being profitably employed.

5. That the maintenance of such forests cannot be justified by the rent obtained for sporting, since such rent is no indication whatever of their productiveness, and cannot be considered as representing any increase of wealth, but is simply the fictitious price paid for the pleasure enjoyed, and consists only of money transferred from one to another.

6. That, allowing that a certain amount of produce is extracted from the chase in venison and grouse, the market value of such produce is inconsiderable and altogether incommensurate with the expenditure incurred for such forests, whilst the permanent injury committed on the land, and far more, the withdrawal of such large portions of land from productive purposes, especially from sheep and cattle, must be considered as most injurious to the country at large.

7. That the gross misappropriation of such land, and the great need of endeavouring to increase the production of animal food at home, are sufficient reasons for the institution of a public inquiry on the subject, and that, following the precedents of commissions and committees on waste lands, it is highly desirable that a Royal Commission should be issued "to inquire into the extent and character of the forests and uncultivated lands in the Highlands, and how far such lands are capable of being rendered productive for agriculture, and otherwise to report on the state of Highland agriculture, and generally on the economic condition of the people in the Highlands and Islands of Scotland."

DISCUSSION.

Mr. Elliott said he had listened to the paper with great attention, but he thought the author had failed to make out a case upon the premises on which he started. He did not absolutely mean to assert that he had failed to make out any case, because in this large and complicated economical subject there was something to be said on both sides of the question; but in his opinion the learned professor had failed to show any great amount of evil arising from the system which it was stated had been going on for some time of turning the land—the mountains, glens, and savage plains of cold and misty Scotland—into deer forests. Deer were as much human food as bullocks or sheep. He altogether dissented from the statement that venison, as an economical food, was wasted. The man who would eat so many ounces of venison could not eat the same number of ounces of beef afterwards, and the beef was left for those who were not able to pay the price of venison; and as to servants wasting venison, he thought they were too good judges to do that. There was also the question of clearing out the cottiers from the Highlands of Scotland, an act which, in his opinion, had been productive of almost unmitigated good. No doubt they shed some natural tears at leaving their native hills, but the cabins which they were forced to quit were so wretched, that he was sure there was nothing like them in England, except the pig-styes; and he thought that the sending these people abroad—as was done, he believed, for the most part with kind and gentle consideration to all their wants—the sending them to the rich plains of America and the fertile valley of the St. Lawrence, was an act of enormous benefit to them. For those people to remain in their wretched dwellings, increasing with the mere increase of animals, without any self-restraint and that far-seeing calculation which characterized the conduct of all rational beings, was an unmixed evil. They increased at such a rate that they were reduced to a state of starvation from the inability of the land to supply the necessary amount of food for them. They fed upon oatmeal, in a country where, owing to the severity of the climate, the harvest often failed. In these northern regions the winter frosts and rains frequently came on while the crops were yet green on the fields, making them rotten and fit for no other purpose than manure; and the wretched people remained hungry all the winter. To clear off these people and to send them where by common industry and prudence they could improve their condition, was to confer

on these human beings an inestimable blessing. That this clearing might have been carried out in some cases to an injudicious extent, was very possible; but if the results in the aggregate had been for good, we ought to rejoice, rather than join in sentimental declamation about the duties of property and the oppression of the poor by the rich. The wretched cottiers of the Highlands had no energy to obtain education, even if they had the opportunities for it; and, besides, there was nothing in the author's paper to show that the state of education in the Highlands was lower now than before the clearance took place. All he had asserted was, that the state of education in the Highlands was not equal to that of the Lowlands; but this proved nothing. It was also true that the people were not so well fed in the Highlands as in the Lowlands, but this was because they chose to live in a poor, cold, and sterile country; and if they did this they must take the consequences. He would express his decided disapprobation of nearly all the views that had been laid down in the paper.

Mr. Scott remarked that property had its duties as well as its rights. It was true that it was only upon very strong grounds that the rights of property should be interfered with, but he thought that large landed proprietors might fairly be expected to employ their land not exclusively for their own profit, but for the public benefit generally. With regard to the evictions of the cottiers, he did not agree that people ought to have their own good forced upon them. It might be that those who were turned out of their holdings had been ultimately benefited, but he did not think the landowner ought to say, "Because you will be benefited by going abroad you shall not be allowed to remain here." What was this done for?—Not for the benefit of the individuals who were evicted, but to increase the gratification of the landowner, by giving him a larger extent of territory, devoted to the rearing and preserving of game. He did not think it was an act of justice to evict these poor people, separating them the one from the other, and tearing them from their country, and thus destroying all the feelings of relationship and patriotism, which were as strong in them as in the inhabitants of more favoured localities.

Mr. Botley remarked that the paper professed to give some idea of the state of the Highlands of Scotland in relation to the supply of food. But while tendering his thanks to the author he (Mr. Botley) thought he had failed to show by statistics, which alone could convey a definite idea on such a subject, what improvement in its agricultural system he really considered advisable as regarded that portion of the kingdom. He would like to have heard the extent and conditions of the holdings which the author of the paper considered advisable, as also the nature of the produce to which the land should be devoted. For his own part, he was anxious to see the food production of this country largely increased, and there was no doubt that this might be done by improved farming. The Chairman of the Council of this Society had stated that fact so broadly and correctly in his opening address this session, that he thought it would be a great advantage to the Society if some gentleman qualified to do so were to give them a paper on the more profitable farming of England, Scotland, and Ireland.

Mr. G. F. Wilson, F.R.S., had hoped that some Highland gentleman, acquainted with the localities in which these deer-parks were situated, would have given the meeting some notion of the proportion of land now occupied for such purposes that was really suitable for general cultivation. The part of the Highlands with which he was best acquainted was rather outside the border which Professor Levi had drawn, but still it was properly the Highland part of Perthshire. He had visited large districts of this county for the last seventeen years, and had watched the changes; and it seemed to him, with reference to that part of the paper which alluded to sheep-walks, that every available portion of land that was suitable for it had been appropriated to that purpose, even to the hill sides of the country. I[n] some instances it appeared to him marvellous that anyo[ne] should have even thought of cultivating such spots [at] all; and he remembered noticing on one occasion th[at] a field had been cleared of stones—most of them bould[ers] —which, if laid together on the field, would have pav[ed] it. With regard to the parts of country that he h[ad] seen, which were devoted to deer-forests, more parti[-] cularly at Moor Rannoch, as far as he was ab[le] to judge, a very small proportion only of these di[s-] tricts was fit for anything else than either a shee[p-] walk or a deer-forest, and he thought they want[ed] some statistics to show what proportion of the la[nd] referred to was suitable for cultivation.

The Chairman said the subject naturally divided its[elf] into two branches, viz.:—first, the clearing of cultivat[ed] parts of the Highlands for sheep; and secondly, th[e] clearing away both human beings and sheep, for th[e] purposes of deer forests. The considerations which ap[-] plied to these were, in his opinion, altogether differe[nt.] With regard to the first, he did not say there were n[o] cases in which the clearing of land for the purpose o[f] changing it to what was thought to be a more profitabl[e] mode of use, had been done in an unjustifiable manner, and without regard to the persons removed. Such cas[es] would, he thought, justify, in extreme instances, the in[-] terference of the legislature, or such an expression o[f] public opinion as might tend to deter landed proprieto[rs] from so abusing the rights of property; but where i[t] was a case of changing land merely from one mode o[f] use to another, no doubt the general principle of la[w] was that this was a question entirely for the considera[-] tion of the proprietor himself. He assumed th[at] where there was no flaw in the title of th[e] great Highland proprietors, they had a right to deal wi[th] their land as they pleased. It was, however, oft[en] difficult to trace the various steps by which mere lea[der-] ships and chieftainships had grown, in process of tim[e,] into an absolute and exclusive right of property in th[e] soil; but, assuming that the great proprietors in th[e] north possessed the absolute fee-simple of their land, h[e] did not think any very strong case had been made o[ut] against them this evening as regarded the displacem[ent] of the population in favour of sheep. There was n[o] doubt that the people were often reduced during th[e] winter season to extreme hardship and privation, to su[ch] an extent that they formerly occasionally resorted t[o] the barbarous practice of cutting out a steak from th[e] hind-quarters of their lean beasts and sewing up th[e] wound again; so that it was no doubt sometim[es] the case that the change was really, to a certai[n] extent, for their good. At any rate the princip[le] of legislation, or rather non-legislation was th[at] the right of deciding as to the best mode o[f] improving the land rested with the proprietor of it. A[t] the same time it was not to be supposed that these lar[ge] tracts of land were granted originally without certa[in] responsibilities being imposed on the owner. The sa[me] community which established the rights of property h[ad] the power, if they found these rights were no long[er] conducive to the public benefit, to ask that they shou[ld] be repealed or modified. Until this was done, howeve[r,] the principle of law remained that it rested with th[e] proprietor himself to decide what was the most profitab[le] way of using his land, and amongst other consideration[s] there was that, no doubt, of producing the greate[st] amount of food with the least amount of labour. Goin[g] to the other branch of the subject, viz., the deer fores[ts,] he must admit there was some truth in the criticism th[at] had been given of the paper by some of the speaker[s,] that it would have been well to have had some esti[-] mate of the extent to which the substitution of dee[r] for men and sheep had interfered with the pro[-] ductiveness of the soil; though if it was true, a[s] stated, that some millions of acres had been devote[d] to these forests, he thought it might be safely a[s-] sumed that this had been the case to a very materi[al]

extent. Notwithstanding what had been said by a preceding speaker on the subject of venison as food, he (the chairman) thought the feeding of deer was a very wasteful mode of employing land which might be appropriated to the production of mountain cattle and sheep. Assuming, then, that the giving up of the land to this purpose absolutely interfered with its productive power, he thought the question might arise between the State and the owners of the soil as to whether, not merely large estates, but what really amounted to a considerable section of that part of the kingdom, should be retained as a mere play-ground. Professor Levi had spoken of the invigorating effects produced upon the wearied brains and bodies of the denizens of our cities by a visit to those Highland sporting grounds; but it was well known that such recreation fell only to the lot of the few, and those few were seldom those whose brains were so much overworked as to render such recreation necessary to their health. One thing he was especially disposed to complain of was that, if he was wandering in the Highlands, he was often stopped by the admonition that he must not go in a certain direction, because he would disturb the game which had been preserved for those who anticipated their September shooting at home by three weeks earlier shooting in Scotland. He was disposed to question the rights of these great proprietors to deny to the community at large the privilege of harmlessly passing over their wastes. Another point put by Prof. Levi was—that, supposing there was any agitation on this subject, would it be possible to check this use or misuse of the land in Scotland? It had been properly pointed out that the abuse had arisen from the game-laws, which were exceptional enactments, but though it might be difficult to pass an Act of Parliament interdicting the encouragement of the breeding and rearing of grouse and deer, yet they might protest against these exceptional laws for the protection of these wild creatures. In the eye of the law, it ought to be no more an offence to shoot a pheasant than a sparrow, and this would be the case if the State were to withdraw—as it might justly do—rights of property which were shown to be abused by the excessive multiplication and preservation of a mischievous class of animals. In conclusion, he would propose a vote of thanks to Prof. Levi for his paper, which, he was sure, however many present might differ from his views, would be unanimously accorded to him.

The vote of thanks having been passed,

Professor Leone Levi, having expressed his acknowledgments to the meeting for the manner in which his paper had been received, said, the great want he had experienced in writing his paper—a want which would be felt by all who entered upon this subject—was the lack of agricultural statistics. There were no statistics of agriculture in Scotland later than 1857, and there were none of any kind in England. It was now several years since he had the honour of bringing before this Society a paper advocating the importance of the establishment of a proper system of agricultural statistics, which gave rise to a discussion that was adjourned to a second meeting; yet it was only now the Board of Trade had obtained statistics of cattle, while the statistics of Scottish agriculture had been suspended since the year he mentioned. It was also to be recollected that the Ordnance Survey of Scotland was behind that of this country. Under such circumstances one must trust a great deal to personal observation and general testimony. He had repeatedly travelled in the Highlands of Scotland, and he found them to be as he had stated; and the universal testimony that had come to him from many quarters concurred in stating that a very large portion of land—how much exactly he could not say, in the absence of statistics, available for cultivation was now wasted and left uncultivated, and he trusted if such an inquiry as he had suggested was instituted, by a Royal Commission or otherwise, they would be able to ascertain precisely how much land there was, that was now unproductive, which might be made available for increasing the supply of food. It was to that object his paper had been addressed.

WORKING MAN'S MEMORIAL TO THE LATE SIR ROBERT PEEL.

The following is from the *Daily Telgraph* :—

After the late Sir Robert Peel had carried the abolition of the corn laws, as Prime Minister, in 1846, a fund was raised, by the penny subscriptions of 400,000 working men of Great Britain, to found a working-men's memorial of gratitude to him. The fund so raised was invested, the University College of London being trustee, in order that the proceeds might be every year devoted to the purchase of books, maps, and other aids to knowledge, to be presented as gifts to any public library, mechanics' institution, reading-room, or literary and scientific institution in the United Kingdom maintained by working men, or to which working men or youths have access gratis, or at a small charge. Since the foundation of this provision, such gifts have been made by the trustee to 41 institutions in England, Wales, and Scotland. The trustee announces that for the present year four gifts, each in value £15, will be made. Applications for them, fully setting forth the particular claims of the institution for which the aid is solicited, should be sent in to the Secretary of the College on or before the 10th of next month.

METHODS OF MUSICAL TEACHING.

The following is from the *Athenæum* :—

Every testimony offered by a musician so thoroughly conscientious as Mr. Macfarren deserves respect and consideration. If I comment on his letter which appeared in the *Athenæum* of March the 3rd, it is in all courtesy, and because I feel that out of honest discussion some approximation towards the truth may be expected to be arrived at.

1st. The opinion that "no conscientious teacher can pledge himself to any uniform system or fixed theory, since his own experience in the practice and in tuition of Art must constantly reveal to him new aspects of the subject to which his attention is directed," is as singular a dogma as has ever been propounded. Surely, before exposition is allowed, the expounder should have made up his mind. Were the Eton Latin Grammar and Euclid to be changed every five years, our collegiate students would fare rather badly. There must be certain fixed convictions—certain bases of instruction—if a college is to be a college, and not a chaotic seminary. I guarded myself, I thought, by stating that all academical teaching was only good *to a certain point*, and for a certain order of pupils. Men of genius, I repeat, have no need of it. Men of talent will find incentive, but not safe grounds for imitative procedure, in the productions of men of genius. Whether the work of art be a picture, a statue, a building, or a musical poem, some fixed principles of rule and proportion by way of central life to be shown in outward form, must be determined on and inculcated. Progress does not imply change of opinions in regard to right and wrong, truth and falsehood. What the converse theory has led to in music we unhappily have lived to see in Germany—taking (as an example of its culmination) the symphonies of my valued friend the Abbé Liszt, and the operas of Herr Wagner.

2nd. Mr. Macfarren's idea that it is sanatory and salutary for "the pupils of different professors" (trained on different methods) "to discuss the various principles of their several teachers,"—howbeit inevitable as a second proposition to the first one commented on, appears to me to bode equally ill for pupil and for teacher.

To learn, rather than discuss, is the pupil's province. Authority first—private judgment after, as soon as the instructed person is strong enough to assert it in his own person and in his own career. I cannot conceive anything more mischievous than a heap of crude intelligences "rating and debating not worth relating" (as Sterne says), as to the value of methods, the origin of which they are incapable, by reason of their inexperience, to fathom. But if the professors, each distinct from each, are to drift here, drift there, drift anywhere—why, then, in the name of common sense (which is not quite drifting), bind them up into a group of teachers? Let each man go his own way, and sit in his own corner—to be discussed by his own scholars, heavy or bright as their wits may be.

And since music and instruction are the question, I may be allowed to call in an authority whose weight no one will dispute in this country, though, according to the "progress" theory in teaching and in pupilage, he is no longer the authority he used to be in Germany. In the last memorable conversation which I held with him at Interlachen, only a few weeks before his decease, and of which as much account was given in a past book of mine as was then permissible, he said, "I cannot conceive how German boys are to be trained any more. The first thing they do is to sit in judgment on their masters!"—The truest of true Germans said this with tears in his eyes.

As "the science of music," says Mr. Macfarren, "is manifestly as progressive as the art, it would be, therefore, monstrous to establish, in 1866, a code of tuition in any of its branches that should be enduring to future generations." Perfectly true; if some of us did not question the progress of Science, as testified by its results in Art. It would be hard, for instance, to prove that the fugue, and the manner of writing thereof, had made much progress since the days of Bach. Compare his best specimens with Beethoven's in his B flat Sonata, or the tremendous piece of complication which closes the "Credo" in his "Solemn Mass." Neither have symmetry and style in melody made any great progress since the days of Mozart. Vocal art has confessedly declined. Instrumental proficiency has changed its forms, rather than added to its resources. Orchestral complication may be said to have been driven to its extremity. In fact, is not the history of all creative Art, be it Sculpture, Painting, Architecture, or Music, a history of periods rather than of progress? If so, it seems to me difficult to imagine any sound course of instruction which shall not, in some degree, include a statute of Imitation.—HENRY F. CHORLEY.

Fine Arts.

DECORATION OF EDIFICES IN PARIS.—The conclusion of the works of the new church of Saint Augustin, in the Boulevard Malesherbes, affords a good opportunity of estimating the large amount of work created in Paris for artists and art-workmen by the authorities. In the first place, the three principal doors of the church, which have recently been hung in their places, are executed in copper, by the galvano-plastic process, after the designs of M. Baltard, the architect of the church. The upper part of the central door is occupied by figures of the cardinal virtues—Justice, Fortitude, Prudence, and Temperance, modelled by M. Mathurin Moreau; the corresponding portions of the two smaller doors are decorated with small figures of angels bearing the signs of the Passion, by the same sculptor. The lower portions of the doors are ornamented with foliage, intermingled with shells, rushes, vine leaves, and ears of corn—emblems of baptism and communion. Embedded in the stone-work over these doors are three medallions of the theological virtues—Faith, Hope, and Charity, enamelled on lava, by M. Paul Balze. Between the arches of the porch are prominent brackets, on which are pl[aced] the apocalyptic symbols of the Evangelists—the E[agle] of Saint John, the Angel of Saint Mathew, the Lion [of] Saint Mark, and the Bull of Saint Luke; these figures [are] sculptured in stone by M. Jacquemart. In niches [richly] decorated, and divided by small columns, are l[arge] statues, in stone, of the Prophets Moses and Elias, [by] M. Chevalier; Jeremiah, by M. Chambard; Isaiah, [by] M. Farochon; Daniel by M. Chardigny; and Ezekiel [by] M. Gruyère. The principal decoration of the fa[çade] consists of a frieze, representing Christ and the Tw[elve] Apostles, by M. Jouffroy. Two small lateral fri[ezes] contain figures of the Fathers and Saints—Saint L[eo] le Grand, by M. Farochon; Saint Augustin, betw[een] Saint Monica and Saint Ambrose, a bas-relief, by [M.] Bonnassieux; and Saint Gregory, by M. Cham[bard]. In niches, on each side of the great frieze, are la[rge] figures of Saint Augustin and Saint Thomas Aquin[as], by M. Cavelier. On each side of the great rose wind[ow] over the portico are figures of angels, beneath pa[lm] branches, bearing the tables of the Old and New Te[sta]ment, the work of M. Lepère. On the parapet, over t[he] pilasters, on the side walls of the portico, are groups [of] children and various religious emblems, by M. Cast[...] and M. Carrier Belleuse. On the summit of the pe[di]ment is a cross, supported by two angels, bearing t[he] cup and crown of thorns, by M. Schroder. These [ex]terior decorations alone amount to forty-five figu[res] sculptured in stone, and three paintings, besides t[he] metal doors; there are, moreover, several minor deco[ra]tive works, such as bronze candelabra, at the entra[nce] and ornamental water-spouts. The interior will [be] decorated in keeping with the exterior, but the fo[rmer] is not in the same state of advancement as the la[tter], and is expected to occupy the whole year.—Two [full-length] statues in marble, one of Mdlle. Mars, by M. J[...] Thomas, and the other of Mdlle. Rachel, by M. D[...] have just been placed upon socles on each side of t[he] vestibule which leads to the noble staircase lately c[on]structed in the Théâtre Français. The foyer or sa[loon] of the same theatre is richly decorated with a bas-r[elief] and statues, and it is connected with a gallery in w[hich] are busts of a large number of the most celebrated d[ra]matic authors and actors. The decorations of the fo[yer] are new; the gallery has been in existence for a l[ong] period, but its contents are being constantly augment[ed].

Commerce.

COTTON BY WHITE LABOUR.—An American p[aper] states that the cultivation of the cotton plant by m[eans] of white labour has been attended with great succes[s in] Mississippi. Several planters in Hind's and Madi[son] counties have white labourers on their plantatio[ns], principally Irish and German. Other planters [are] patiently awaiting the arrival of white labourers, [for] whom they have sent orders through establi[shed] agencies. It is said that this class of labourers [are] generally performing their work satisfactorily, and a[re] well pleased with their employment. This seems [the] beginning of that domestic change in the labour sys[tem] of the country, the gradual development of which [will] result in a substitution of white labourers in the plac[e of] negro freedmen. The time will, perhaps, come whe[n] the lands of the South will be cultivated by white m[en].

COTTON CROP IN AMERICA.—Three months ago, [the] general idea was that 1,200,000 bales was as much [as] could safely be reckoned upon, although some were s[an]guine enough then to anticipate that a yield of 1,500,[000] to 1,800,000 bales might, with average weather, [be] looked for. The negroes all over the South h[ave] made contracts and set heartily to work; and though [in] some districts it is said that not more than one-fourth [of] the former area will be put in cultivation, in som[e] third to a half, in Tennessee and Texas it seems probab[le]

that the area will equal or exceed any former year. On the whole, the indications point to from 1,500,000 to 2,000,000 bales. The Committee of Ways and Means at Washington has reported in favour of a revenue tax of 5c. per lb. on cotton (instead of the present tax of 2c.), with a drawback on cotton manufactures exported. This tax, although it is not a large per-centage on the present high price of the article, amounts to at least 40 per cent. on the cost of cultivation, an enormous weight to place upon an agricultural product in the production of which so many countries are now competitors.

Coffee.—As much attention has been directed to the careless manner in which the garbling and preparation of coffee for export has of late been effected, we (*Travers' Circular*) quote the following remarks relating to the details of exportation from a work recently published by Mr. A. W. Lascelles on Coffee:—"The several operations of peeling, garbling, sizing, and packing for export, are generally out of the planter's control, and are performed by the agents at the shipping port, who frequently purchase the coffee in the parchment, or undertake to deliver it on board ship at a given rate per ton. The general charge for garbling, packing, &c., is £5 per ton. There are several large establishments at Colombo, in Ceylon, and Tellicherry, Calicut, and Mangalore in India, for the preparation of coffee for shipment, some employing two to three thousand hands daily. The machinery by which the parchment is removed is termed a peeling mill. It consists of double wheels of solid heavy wood, shod with sheet copper; this breaks the parchment skin. The coffee is then winnowed, and if care has been taken in curing the coffee, the whole of the parchment and silver skin will have been removed, and the coffee will present a clean, horny appearance. It is then garbled, as it is called, or examined by women and children, who pick out all the discoloured beans; it is then passed through cylinders or sieves, made of perforated zinc or wire, by which it is separated into different sizes, the pea berry being separated, from its rotundity, by a peculiar rolling motion in baskets, by hand labour. The coffee is then ready for packing and shipment."

Colonies.

The Whaling Trade at Hobart Town.—The statistics of whaling at this port for the last ten years are given in a colonial journal as follows:—

Year.	Whales secured.	Takes of Sperm. tuns.	galls.
1855	12	511	80
1856	24	862	220
1857	22	615	233
1858	22	623	2
1859	19	486	227
1860	22	447	212
1861	16	652	258
1862	16	697	211
1863	12	92	217
1864	10	361	21
1865	6	362	—

This was all sperm oil, and the average of the ten years' take landed from these vessels would consequently be something like forty-one and a half tuns from each. There were also landed in the years above named about 300 tuns of black oil and 160 tuns of black fish oil. The amount of whalebone is not given.

Drought in New South Wales.—The drought has had the effect of all but ruining some of the squatters of the far west, whilst very few have escaped without heavy loss. On one station, where 120,000 sheep had been guaranteed to the shearers, only 60,000 could be brought into the shed; and on another station, in the same district, only 113,000 were shorn, when there should have been 160,000. In each case the deficiency had been caused by deaths in the flocks owing to the want of food and scarcity of water. Thousands of sheep were still on the move, travelling over the country in search of the grass not a vestige of which remained on their own runs. Cattle were reported as dying by hundreds, worn down by the want of food and the travelling for water. They lie down in the water-holes where they have satiated their thirst, and there die in such numbers that now the position of a water-hole may be ascertained at a very long distance by the noxious effluvium from the decomposing carcases.

Victorian Railway Returns.—The following is a statement of the traffic returns of the Victorian Government line of railways, and of the Hobson's Bay and Melbourne United Railway Company's line, for the month of December, 1865:—Government lines—Passengers, £23,685 11s. 2d.; goods, £27,621 17s. 8d.; total, £51,307 9s. 10d. Melbourne and Hobson's Bay United Company—Passengers, £8,346 16s. 4d.; goods, £2,441 5s. 6d.; total, £10,786 1s. 10d. The total number of persons conveyed on the former was 113,160, and on the latter 296,879.

The Number of Ships which cleared from the United Kingdom for Australia and New Zealand during 1865 was 404, with a tonnage of 379,597 tons, against 463 vessels, with a tonnage of 399,437 tons, in 1864. The number of vessels entered inwards from Australia and New Zealand during 1865 was 196, of 169,614 tons, against 148, of 127,363 tons, in 1864. The value of imports and exports at Port Adelaide up to 16th December, 1865, was £2,491,917 and £2,168,190 respectfully, against £2,494,172 and £2,419,353 for the same period of 1864. The number of immigrants at Port Adelaide from the commencement of the year to the 16th December was, as shown by the official returns, viz., immigrants, 7,719; emigrants, 3,695.

North Australia.—The inspector of sheep, in a report dated 5th January, 1866, says that the far north may be said to be entirely deserted. The disastrous losses to which the settlers have been subject during the latter part of last year still continue, and the loss will ultimately appear more than is anticipated. The far north is utterly unfit for agriculture. Not even a crop of hay can be grown there two years out of five; and, to show that it is not merely the squatters who condemn the country, it is reported by the recent commission that the average rainfall throughout the far north does not exceed 2¼ inches per annum in ordinary seasons. The country must therefore be used for pastoral purposes, or fall back into an unoccupied state.

New Zealand Canals.—A proposal has been made for the construction of a canal uniting the navigation of the Kaipara and Waitemata and the settlement of a block of provincial land of about 450,000 acres. In the Kaipara district there is an immense territory of agricultural land, and generally of good quality. This land is accessible by the land-locked sea known as the Kaipara, and by navigable rivers and canals providing easy and available means of inland transit, but it is cut off from Auckland as effectually as if it were on the west coast of Canterbury for all purposes of trade and commerce. A canal of a few miles, through what might be called a level country, from Brigham's Creek to the head waters of the Kaipara, would connect the port of Auckland with that district, and make available to river steamers and barges of light draught about 300 miles of tidal river navigation. The block of land proposed to be given to any company which will construct the canal and cultivate the land is intersected by two navigable rivers. It is generally rich agricultural land.

Obituary.

The Rev. William Whewell, D.D., Master of Trinity College, Cambridge, died on Tuesday, the 6th of

March. His father was a carpenter or joiner at Lancaster, and it was intended that William, the son, who was born in the year 1795, should follow the same calling. Fortunately, he had been sent to the Free Grammar School of his native town, where he discovered such an unmistakable genius for mathematics, that the head master prevailed upon the young man's parents to allow him to be sent to Cambridge, predicting a brilliant career for him there. Arrangements were accordingly made, through the instrumentality of a generous patron, and he entered Trinity College about the year 1813, and from that day to his death he was closely associated with that college. He took his degree of B.A. in 1816, became a fellow of his college shortly after, and was for many years an eminent and successful tutor. At the time when he began to assume an active part in university education, the definite study of physics was virtually superseded by mathematics, under the idea that the latter included everything necessary to be known of the former. To the credit of Dr. Whewell be it said, that he was foremost among the distinguished men who rectified this dangerous error, devoting himself especially to the study of mineralogy and crystallography. In 1828 he was appointed Professor of Mineralogy, a post he held for four years; and in 1838, Professor of Moral Philosophy, which chair he retained till the year 1855, and in 1855 he was elected Vice-Chancellor of the University. He succeeded to the Mastership of Trinity in 1841. In 1820 he had been made a fellow of the Royal Society, in the labours of which he has always taken a prominent part, as well as in those of the British Association for the Advancement of Science, over which he presided at Plymouth in 1841. On this occasion he drew up a memoir on the state and progress of Mineralogy. This has since been incorporated into his "History of the Inductive Sciences." He devoted himself to the study of the phenomena of the tides, and his papers on this subject, which are considered highly interesting and valuable, will be found in the "Philosophical Transactions." For two years Dr. Whewell was President of the Geological Society. His first wife, of the family of Marshall, of Leeds, was a sister of Lady Monteagle; she died in 1854. He afterwards married Lady Affleck. Dr. Whewell's principal works are:—"A History of the Inductive Sciences," "The Philosophy of the Inductive Sciences," which has since been expanded into "The History of Scientific Ideas," "Novum Organum Renovatum," "The Philosophy of Discovery," "The Bridgewater Treatise on Astronomy," "Notes on the Architecture of German Churches," "Lectures on the History of Moral Philosophy in England," "Lectures on Systematic Morality," and "Indications of the Creator," written in answer to the "Vestiges of Creation." Besides these he has published many educational mathematical works, and treatises on University education in connection with University reform. He also translated Göethe's "Hermann and Dorothea," Auerbach's "Professor's Wife," Grotius on the "Rights of War and Peace," and Plato, under the title of "Platonic Dialogues for English Readers." He was the author of "The Plurality of Worlds," which, however, did not appear under his name. Members of the Society of Arts will recollect that when a course of lectures was delivered before the Society in 1852, on the results of the Great Exhibition of 1851, the inaugural lecture was given by Dr. Whewell, the subject being "The General Bearing of the Exhibition on the Progress of Art and Science." He also delivered a lecture before the Society in 1854, on "The Industrial Helps to Education," on the occasion of the Society's Educational Exhibition.

Notes.

The Paris Universal Exhibition of 1867 will offer to the public, among other curiosities, says the *Moniteur*, an aquarium which will be thirty metres long by twenty metres in height. It is intended, as in the aquarium of the Acclimatisation Society, to bring together as complete a collection as possible of the most curious specimens of the submarine world. The size of the aquarium will cause spectators to fancy that they are under water. On looking upwards, the rare opportunity of seeing sharks, tunny fish, cod, and porpoises disporting themselves in their own element, will be given; and it is expected that this will form one of the many interesting features of the forthcoming exhibition.

Improved Facilities for International Intercourse.—The marked improvement which has taken place of late on the Continent with respect to the means of exchange and intercommunication is one of the most decided signs of the times. A year since the system of international post-office orders was inaugurated between France and Italy, and the terms of the convention have now been fully carried out for some months, so that small sums of money may be transmitted with the greatest facility from France to any part of Italy, and *vice versâ*, at a cost of twopence for each sum of eight shillings. In Paris an Italian money-order may now be obtained at any of the district offices of that metropolis. With the commencement of the present year a similar system came into operation between France and Belgium and other countries, and in a short time, it is believed, the same will take place between the former countries, Prussia, and the greater part of Germany. A monetary convention has recently been signed by the representatives of France, Belgium, Italy, and Switzerland, which will also aid in the simplification of matters of exchange. Belgian, Italian, and Swiss money used to circulate pretty freely in France, and especially in Paris, but the difference in the intrinsic value of the coins gave rise to speculation, and disarranged the monetary system, and at the present moment Swiss coins are not current in France. The object of the new convention is to establish rules for the fabrication of money in all the subscribing states, and to regulate the values of the small coins so that the currency of each country may be freely accepted in all the others; in fact, that these four countries which touch each other, and are intimately connected in business, shall be in complete monetary union. Great ameliorations have also been made in the telegraphic system between France and other countries, and a new convention took effect on the first day of this year, by which the price of a dispatch of not more than twenty words passing between any two offices in France and Switzerland, with one exception, named below, is fixed at three francs. The exception referred to is that of messages between the offices on the frontiers of the two countries; and in this case the rate is fixed at two francs for twenty words; the entire departments of Savoie and Haute Savoie, and the cantons of Fribourg, Neufchatel, Argovie, and Bâle, are all declared to come under the denomination of frontiers, and to be liable only to the lower rate of two francs. The Minister of the Russian post has just announced that regular postal communication is now established with Pekin and Tien-Tsin, and that letters and papers of value may now be sent from St. Petersburg across Siberia, the desert of Cobi to the capital of the Chinese empire, or even to Tien-Tsin, at the rate of sixteen pence for a single letter. Europe is thus put in direct overland communication with the Pacific ocean. The postage rates between France and Belgium were reduced, from the 1st of January in the present year, from fourpence to three pence for ten grammes or the third of an ounce, and those of newspapers, printed matter, and samples, diminished in like proportion, and many of the restrictions and complications connected with the old system were removed. On the same day came into operation the new rates fixed by a convention passed between France and Prussia. The postage of a letter, prepaid, passing between a French and a Prussian office, not more than fifteen miles apart, is fixed at two-pence for the third of an ounce, and

he rates of letters and other matters passing between he French Empire and the States of Denmark, Sweden nd Norway, and Russia, are reduced in like manner. astly, the French Government has recently announced reduction in the postal rates with respect to letters, journals, printed matter, and samples, passing between the French Empire, the Marquisas, and the Society Islands by he way of the Isthmus of Panama, the new initial rate or prepaid letters being tenpence for the third of an unce. These facilities of communication are the result f increasing trade and prosperity, and will be the cause f still further progress; and it is to be hoped that before nother year passes over our heads the postal arrangements between France and England will be modified, or if a letter weighing one-third of an ounce can be arried from Paris to Brussels for threepence, there can e no valid reason for a letter weighing only a quarter f an ounce being taxed fourpence for transport between Paris and London; and as money can be sent by means f a post-office order between Paris and Turin, it is ifficult to conceive why the same facilities should not xist between London and every capital on the connent.

Consumption of Ice in Paris.—The use of ice is eneral in Paris during the summer months; it is supplied in almost every café and restaurant, and scarcely a reengrocer or a milkshop in the better portions of the own is without an ice-chest for the supply of its customers. The quantity consumed is said to amount to welve or fifteen thousand tons a year. Besides the sale f rough and pure ice, there is a large trade done in what re called *carafes frappés*, that is to say, water decanters r bottles, in which nearly the whole contents are frozen y rapid revolution in a freezing mixture. These *carafes* re supplied to the cafés and also to private families each orning, and being constantly kept filled up with water erve throughout the whole day under ordinary temperatures. Another application of these *carafes* is to fill them p with champagne or other wine, and thus to obtain ol and diluted drinks for evening parties in hot eather.

Proportion of the Sexes.—The changes which have ken place in various countries in the proportion of the ale to the female portion of the population, present a urious problem; in France and England the excess of males is rapidly increasing, while in Austria the conrary is the case. In the last-named country the dimiution of female births has been continual and inreasing since 1830, and at present it amounts to 3-10ths er cent. in six years, a rate which, if continued for wo centuries, would leave few women in the country. n England, as is well known, the change is progressing n the opposite direction. In France the male have lways been in excess of the female births, the proporion being for a long time 106 boys to 100 girls, but of te the proportion has been on the decline; it fell to 04·80 in 1860, but rose again to 105·53 in 1862. The roportion, however, varies in the different parts of the untry, the proportion of boys being always greater in e rural districts than in the towns, and generally less n Paris, or rather in the metropolitan department of e Seine, than elsewhere. The average of the three ears of 1860 to 1862, both inclusive, gives the following the number of male to 100 female births:—

In the department of the Seine......	103·60
In the towns generally	104·51
In the rural districts	105·45

t appears, then, that not only do the births in cities nd towns bear a smaller proportion to the population an they do in rural districts, but also that the proporon of females is larger in the former than in the latter ase. It appears, from like returns, that the number of lind persons in France is more than thirty thousand, f whom only thirteen thousand are women; as regards diotism, the number of females thus afflicted is smaller han that of the men, the proportions being eighteen thousand of the former to twenty-three thousand of the latter; insanity, on the other hand, is far more common amongst women than men.

Correspondence.

Mr. Coningsby's Paper on the Anglo-French Exhibition.—Sir,—Mr. R. Coningsby, the late secretary of the Anglo-French Exhibition, held at Sydenham last autumn, has read a paper at the Society of Arts, on that meritorious attempt, but unsuccessful achievement, as also on the formation of an Anglo-French association. Your valuable space is too limited to permit of my entering very fully into all the points which such a subject comprehends; but having watched the proceedings of that exhibition with very great interest, I hope you will allow me to offer a few observations. I believe that the object sought in working men's exhibitions ought to be well defined—better than it is at present, at all events before it is attempted to give them an international character. Working men's exhibitions, as such, ought to be opened only to working men, or else they lose their peculiar attraction. Then it ought to be stated in what manner they can serve the working man. Is it economically or socially, in emancipating him from the avaricious exactions of unjust employers? Is it industrially or artistically, in giving due emulation and reward to his efforts towards improvement; or are such exhibitions only the passing satisfaction of public curiosity at something novel; in a word, an attempt to get up a show without a purpose? That movement has now taken sufficient importance to justify us in asking a frank avowal of the purposes aimed at by those who get them up, for I will believe that they have some loftier aim than that of personal thirst after importance or gain. The idea of working men's exhibitions, in opposition to ordinary exhibitions, must necessarily be an idea of re-vindication against some neglect or injustice. Working men were ignored in the great exhibitions that have been held; their works were admired and rewarded in the persons of their employers, or of mere speculators, who had no other merit than that of having ready money at command, and who paraded themselves unblushingly, like the turkey of the fable, in the peacock's feathers. If, therefore, upon proper remonstrances being made to the commissioners entrusted with the framing of the regulations for the forthcoming great exhibition of 1867—and who could better than the Society of Arts make such remonstrances?—this grievance was removed, the first and the second plea for working men's exhibitions would fall to the ground; working men would be admitted on an equal footing with other exhibitors; employers would have to give the names of those they have employed in the making of articles exhibited, and thus, by the mere working of a just measure, there would be emulation and reward for the working man, and at the same time the publicity given to his name would be a check to the too-selfish employer, because the value of the meritorious workman would rise in the market with the competition between employers to secure his services. I am quite of opinion that the great assizes of human labour would lose their interest and *éclat* were they held too often; but this does not apply to national or local exhibitions, which I am not considering here. As to the desirability of an Anglo-French association of working men, no one desires it more earnestly than myself; I should even like to see a universal and international one; but however much we may desire to see it realised, the project is too vast and too complicated, as yet, on account of the many political, social, and religious barriers which still divide men and nations, to leave us any hope of being able to do more than merely propound the proposal. It must be left to the silent but marvellously active operations of free trade, commerce, and international intercourse, to bring about a better

knowledge of each other amongst men and nations.—I am, &c., Joseph Collet.

283, Strand, W.C., 15th March, 1866.

P.S.—It is here that an association to help working men to exhibit, such as the one established last year in Paris, could usefully step in.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. Geographical, 8½. Sir H. C. Rawlinson, K.C.B., M.P., "Observations on some recent Travels in the countries between Kashmir and the Russian Frontier."
British Architects, 8.
Actuaries, 7. Mr. Peter Gray, "On the construction of Tables by the method of differences."

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon Mr. Williams's paper, "On the Maintenance and Renewal of Permanent Way."
Zoological, 8½.
Ethnological, 8. 1. Mr. John Crawfurd, "On the Invention and use of Writing Materials." 2. Prof. Dadabha Naoroji, "Notes on Mr. Crawfurd's Paper on the European and Asiatic Races."

Thurs...Chemical, 8. Annual Meeting.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 12th March, 1866.

57. Bills—New Forest Poor Relief.
58. „ Merchant Shipping Act (1854)—Amendment.
19. Metropolitan Board of Works—Account.
63. Navy (Dockyards and Steam Factories)—Return.
88. Jamaica—Correspondence.
102. Navy—Scheme.
Victoria, Australia—Correspondence.

Delivered on 13th March, 1866.

50. Bills—Marriage with a Deceased Wife's Sister.
51. „ Legitimacy Declaration, &c.
53. „ Clerks to Justices.
15. (213 to 223) Railway and Canal, &c., Bills—Board of Trade Reports.
18. Metropolitan Board of Works—Report.
78. Metropolis Turnpike Roads—Fortieth Report of the Commissioners.

Delivered on 14th March, 1866.

62. Bill—Public Offices (Site) (as amended).
15. (224 to 238) Railway and Canal, &c., Bills—Board of Trade Reports.
24. Sheriff Courts (Scotland)—Return.
86. Dead Meat Markets, &c.—Letter.
89. London Steam-ship Report.

Delivered on 15th March, 1866.

68. Bill—Representation of the People.
15. (239 to 257) Railway and Canal, &c., Bills—Board of Trade Reports.
32. Woods, Forests, and Land Revenues—Abstract Accounts.
95. Ellen Hampson—Report.
105. Savings Banks—Return.
Cattle Plague (Belgium)—Report.
Public General Acts—Caps. 5 and 6.

Delivered on 16th March, 1866.

59. Bills—Thames Navigation.
63. „ Writs Registration (Scotland).
64. „ Summary Procedure (Scotland).
70. „ Parliamentary Oaths Amendment (as amended in Committee).
15. (258 to 268, and 271 to 276) Railway and Canal, &c., Bills—Board of Trade Reports.
31. Revenue Departments—Accounts.
92. Army (Hong Kong and Kowloon)—Statement.
96. Dover Pier—Correspondence.
103. Smithfield Dead Meat Market—Memorial.
108. Army—Return.

Delivered on 17th March, 1866.

69. Bills—Railway Clauses.
72. „ Cattle Sheds in Burghs (Scotland).
15. (269 to 283) Railway and Canal, &c., Bills—Board of Trade Reports.
60. (I.) Railway and Canal Bills—Second Report.
94. Bridget McCready—Correspondence.
100. Charity Commission—Thirteenth Report.
101. Navy—Supplementary Estimate.
Railways in Ireland—Evidence and Papers.

Delivered on 19th March, 1866.

61. Bills—Waterworks.
65. „ Trusts (Scotland).
66. „ Poor Law Officers' Superannuation (Scotland).
73. „ Valuation of Lands and Heritages (Scotland).
74. „ Exchequer Bills and Bonds (as amended).
75. „ East India Military, &c., Funds—Transfer.
77. „ Dockyard Extensions Act Amendment.
15. (277 to 285) Railway and Canal, &c., Bills—Board of Trade Reports.
98. Houses of Parliament—Report of "Dr. Percy."

Delivered on 20th March, 1866.

71. Bill—Land Tax Commissioners.
15. (286 to 293) Railway and Canal, &c., Bills—Board of Trade Reports.

Patents.

From Commissioners of Patents' Journal, March 16th.

Grants of Provisional Protection.

Bricks—618—G. Cowdery.
Cigarettes, making—510—M. J. Lopez-y-Munoz.
Crabs or winches—531—A. H. Robinson.
Electric telegraph conductors—469—D. Nicoll.
Fibrous materials, combing, &c.—30—J. Ronald.
Fibrous materials, flyers used in preparing—614—J. B. Booth.
Files for holding letters, &c.—612—P. Brampton.
Fire-arms, breech-loading revolving—610—D. L. Cohn.
Fluids, pump buckets for lifting—553—J. Goodfellow.
Forges—2378—W. E. Gedge.
Galvanic currents, producing—582—I. L. Pulvermacher.
Healds and reeds—573—W., T., and J. Richmond.
Lace, making—589—C. E. Treadwin.
Lever, adjustable—391—J. Roe.
Liquid substances, distilling—606—W. E. Newton.
Metal, cutting—596—J. Wolstenholme and J. T. Pendlebury.
Metallic sheets, &c.—544—W. Deakin.
Pin cartridges—592—W. Clark.
Plants, extracting the juice from—594—W. E. Gedge.
Railway brakes—564—J. Kelly.
Saws, &c., tempering—602—J. Dodge.
Sewing machines, applying motive power to—600—G. Hunt.
Ships—2982—J. Weems.
Skins for tanning, preparing—560—C. de Casmaris.
Skins, treating—238—E. and J. Tussey.
Square-topsails and top-gallant-sails—404—W. Davidson.
Street cabs, and harness for same—605—M. Cole.
Submarine telegraph cable—465—H. E. R. de Gableur, jun., and E. Mahler.
Tar, &c., distilling—616—W. E. Newton.
Tools, driving—604—F. M. Eden.
Vessels of war—548—J. Walker.
Weaving, looms for—543—M. and J. Robinson, and W. Smith.
Weaving, shuttles for—596—W. Allinson and R. Lowe.
Weighing machines—608—W. R. Lake.
Wool, combing—568—G. E. Donisthorpe.
Yarns, washing—570—C. Mather.

Invention with Complete Specification Filed.

Steam engines, rotary—666—A. C. Baldwin.

Patents Sealed.

2376. F. Daine.
2384. R. Fox.
2393. L. Villette.
2396. J. Edmondson.
2399. J. Tye.
2408. J. R. Haines.
2407. E. W. Collier.
2410. H. Hibling.
2412. B. Chaffer, and J. and C. Thompson.
2413. H. A. Davis.
2473. R. A. Brooman.
2414. W. R. Lake.
2418. R. Atkin.
2422. J. Sheldon.
2428. M. Cartwright.
2431. R. T. Hughes.
2441. J. Parkins.
2445. J. Dreissmer.
2502. A. R. Shaw.
2512. A. Nicholls.
2886. G. Cochrane.
3034. G. T. Bousfield.

From Commissioners of Patents' Journal, March 20th.

Patents Sealed.

2435. J. H. Johnson.
2449. J. W. Coburn.
2450. G. F. Smeeton.
2453. A. Prince.
2455. R. T. N. Hovey.
2459. J. Hargreaves.
2460. W. Ambler.
2472. G. Eveleigh.
2480. J. Boffey and C. W. Smith.
2484. C. Price.
2490. A. M. Bennett.
2529. H. A. Bonneville.
2568. H. F. Smith.
2575. W. A. Martin.
2601. W. Harris.
2602. J. G. Woodward.
2608. W. E. Newton.
2662. G. H. Murray.
2720. J. Stanley.
2964. E. and J. Dellett.
3152. G. T. Bousfield.
3164. G. T. Bousfield.
3277. G. T. Bousfield.
3282. A. V. Newton.
8. G. Schwartz.
153. M. Allien.

Patents on which the Stamp Duty of £50 has been Paid.

737. G. de Laire.
815. J. Dale and G. Bischof, jun.
751. J. Brigham and R. Bickerton.
733. A. Mard.
720. W. Symington.

Patents on which the Stamp Duty of £100 has been Paid.

640. R. Waller.
644. R. A. Brooman.
642. T. Lightfoot.
653. W. Clark.
702. H. Marchant.
695. J. Dixon and R. Clayton.
699. H. Bessemer.
721. W. A. Gilbee.
735. W. Hodgson.
760. G. P. Colas.

Journal of the Society of Arts.

FRIDAY, MARCH 30, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'Clock:—

APRIL 4.—The Manufacture of Sugar, and the Machinery employed for Colonial and Home Purposes." By N. P. BURGH, Esq.

APRIL 11.—"On the Piracy of Trade Marks." By E. M. UNDERDOWN, Esq., Barrister-at-Law.

CANTOR LECTURES.

The following is the syllabus of a course of four lectures "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures." To be delivered by Dr. F. CRACE CALVERT, F.R.S., as follows:—

LECTURE I.—FRIDAY, APRIL 13TH.

"ON THE SYNTHESIS OF ORGANIC SUBSTANCES."

The direct formation of *acetylene* (the most illuminating compound of coal gas), of *formic acid* (the acid of ants), and of *alcohol* (spirits of wine) from mineral compounds. The transformation of *acetylene* into *olefiant* gas, of *formic acid* into *marsh gas* (fire-damp), of *alcohol* into *acetic* acid, and of these substances again into *benzol*, *phenol*, and *napthalin* (products obtained from coal tar), and of *marsh gas* into *acetylene* and *benzol*, &c., &c., &c.

LECTURE II.—FRIDAY, APRIL 20TH.

"ON THE TRANSFORMATION OF NEUTRAL SUBSTANCES."

On the transformation of *starch* into *cane* and *grape sugars*, and also *pectic acid* (with remarks on the ripening of fruits and the production of jellies). On the transformation of *sugar* into *alcohol*, *ether*, *aldehyde*, *acetic*, *formic*, *prussic*, *oxalic*, and *butyric acids* (the acid of rancid butter), and also the conversion of *sugar* into *mannite* obtained also from manna), and into *lactic acid* (acid existing in the blood and flesh of animals, and also in our milk).

LECTURE III.—FRIDAY, APRIL 27TH.

"ON THE TRANSFORMATION OF ORGANIC ACIDS AND ANIMAL SUBSTANCES."

The artificial production of *benzoic acid* (found in benzoin resin) from the essence of *bitter almonds* and from *coal tar* products, and its conversion into *hippuric acid* (found in the secretion of herbivorous animals); of *tartaric acid* (the acid characterising cream of tartar), from *sugar of milk* and from *succinic acid* (the acid obtainable from amber), and its decomposition into *oxalic* and *acetic* acids—On the transformation of *citric acid* (the acid of lemons and oranges) into *aconitic acid* (found in wolfsbane)—On the transformation of *malic acid* (which characterises the acid flavour of green gooseberries, apples, and rhubarb) into *fumaric acid* (the acid of common fumitory) and also into *equisetic acid* (the acid found in the marsh horsetail), and, lastly, into *asparagine* (the body found in asparagus and potatoes)—On the transformation of *uric*, *cyanuric*, and *cyanic* acids into *allantoin* (the substance found in the allantoid fluid of cows)—On the artificial production of *urea* (a substance which characterises the liquid secretions of man and of many other animals).

LECTURE IV.—FRIDAY, MAY 4TH.

"ON THE ARTIFICIAL PRODUCTION OF AROMATIC SUBSTANCES."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadow-sweet*, *coumarin*, and of the *tonquin-bean*—On *salycilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor*; of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

ART WORKMANSHIP PRIZES FOR 1866-7.

The Council have decided to enlarge the basis on which artisans may compete for prizes for Art Workmanship, and have passed the following resolutions:—

Any producer will be at liberty to exhibit, either in his own name, or through his workmen, any work or works as specimens of good workmanship in the classes given below, provided that the work or works be accompanied with a statement of the name or names of the artisans who have executed their respective portions; and if the work or works be sufficiently meritorious to deserve them, extra prizes will be given to the artisans who have executed them.

Artisans may, if they think fit, exhibit works executed by them after other designs, in any of the above-mentioned classes. Such works may contain the whole or portions of the prescribed designs, and must be of a similar style and character. Competitors must specify the class in which they exhibit. Extra prizes will be awarded.

The works submitted must be delivered at the Society's House on or before the 22nd December, and will be exhibited at the Society's house, and afterwards at the South Kensington Museum. A selection of the best works will be made and sent to the Paris Exhibition of 1867.

The Classes will be as follows:—

FIRST DIVISION.

WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.

CLASS 1.—Carving in Marble, Stone, or Wood.
CLASS 2.—Repoussé Work in any Metal.
CLASS 3.—Hammered Work, in Iron, Brass, or Copper.
CLASS 4.—Carving in Ivory.
CLASS 5.—Chasing in Bronze.
CLASS 6.—Etching and Engraving on Metal—Niello Work.
CLASS 7.—Enamel Painting on Copper or Gold.
CLASS 8.—Painting on Porcelain.
CLASS 9.—Decorative Painting.
CLASS 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.
CLASS 11.—Cameo Cutting.
CLASS 12.—Engraving on Glass.
CLASS 13.—Wall Mosaics.
CLASS 14.—Gem Engraving.
CLASS 15.—Die Sinking.
CLASS 16.—Glass Blowing.
CLASS 17.—Bookbinding and Leather Work.
CLASS 18.—Embroidery.
CLASS 19.—Illuminating.

SECOND DIVISION.

WORKS TO BE EXECUTED WITHOUT PRESCRIBED DESIGNS.

CLASS 20.—Modelling.
CLASS 21.—Wood Carving.

Except in Classes 1, 2, and 4, the subjects will remain as in the list already issued; but in Classes 1, 2, and 4, other subjects will be given, particulars of which will be duly announced.

NATIONAL PORTRAIT EXHIBITION, 1866.

Season Tickets for this Exhibition are now ready, and may be had at the Society of Arts, on application to the Financial Officer, price £1.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The following answers have been returned by Mr. Capes to the queries given below:—

1. Do you wish to modify any of the opinions expressed in your letter to the *Pall-Mall Gazette* (see *Journal*, p. 294), and if so, will you state in what respect?—No.

2. You speak of the necessity of a thorough education and cultivation of musical teachers and performers. Other qualifications being equal, would you prefer that the principal should be a professional musician, or do you draw no distinction as respects the qualification of this head of the establishment between a place of general education and a place of special education?—Under any circumstances I think a professional musician would be an undesirable principal to a national academy, for the reasons stated in my letter to the *Pall-Mall Gazette*. No professional musician could be thoroughly independent of influences which would tend to diminish his authority and control.

3. Please to state in detail, and in the order of their importance, what you consider should be the qualifications demanded for admission to the Royal Academy of Music?—Musical capacity and good conduct.

4. At what age should applicants be admitted?—It is difficult to say. It would be useless to admit boys to learn singing until after the voice has "broken." Besides, the system of the Academy should be adapted to young men and women, rather than to boys and girls.

5. Would you reject applicants having great musical aptitudes, if imperfectly educated in general knowledge?—No.

6. Do you think that sufficient funds, either from Parliament or private sources, could be obtained to pay for affording an extensive general education in the Royal Academy of Music?—I do not think that subscriptions could ever be obtained from the public to such an extent as to make it safe to rely on them. I should think that Government would be more willing to grant funds for an academy such as I have sketched out than for the mere teaching of music alone.

7. Do you consider the same amount of general education necessary for the performer of music as for the teacher of music?—Precisely the same.

8. Without implying the slightest depreciation of the value and importance of the highest and widest cultivation, cannot many artists in music, painting, and the fine arts generally, be instanced who have been uncultivated, but who have delighted and benefited the world with their art?—Very possibly, if it is meant that they were ill-educated as children; and the same may be said of some men eminent in politics and every other form of intellectual work. But in fact such persons always educate themselves. Academies are meant for the cultivation of the average class of minds.

9. Rugby is a school for training and educating gentlemen; it embraces in its studies all those subjects which are supposed to constitute the general education of a gentleman, whatever his subsequent pursuits. Classics are considered an important part of such an education. Would Dr. Arnold have been appointed unless, with his knowledge of English literature, he had possessed great classical attainments? In fact, was not Dr. Arnold appointed because his general attainments fitted him for being at the head of a place of general education; and his classical attainments for a place of classical education?—I really do not know why the Rugby trustees appointed Dr. Arnold to be head master of Rugby. He was a popular and successful private tutor, living away from Oxford, and was known to get on very well with boys. He never had any claim to be accounted a great classical scholar. His after reputation was founded entirely upon his success as a schoolmaster, which was the result, not of any extraordinary attainments of any kind, but of his having the penetration to perceive that boys should be treated as rational and responsible creatures. Of course, in all that I have said, it is implied that the Principal should be a man with sound musical acquirements, but not one who gains his living by music as a profession. The largest amount of musical knowledge is quite compatible with a want of that purely technical facility in performance and in composition which we require in a professional performer and teacher.

The following letter has been addressed to the Editor of the *Pall Mall Gazette*:—

SIR,—I hope it may not be too late to offer a few remarks upon the interesting, but I think mistaken letter of Mr. Capes as to the investigation of the Society of Arts Committee of Musical Education, which appeared in the *Pall Mall Gazette* several days since. (See *Journal*, p. 294.)

I could say much upon the alleged scantiness of the general education of musicians to show that, as a body, they are not worse off in this respect than their cousins, the children of one of the sister arts; and I could say much on the same subject to prove that a very wide course of literary and scientific study is incompatible with sound musicianship; but I will pass over this topic, grave as it is, rather than distract attention from the still more important and startling proposal advanced in the letter.

It is urged that the head or principal of any Government-endowed musical academy should not be a professional musician. I am certain that the contrary is the case, and that no institution can gain either the confidence of the public or the support of musicians which is not entirely and freely directed by a man who has spent his whole time in the study and practice of the art, and has passed through all the vicissitudes of a professional career. It is only one who has proved the pains as thoroughly as the delights of an artist's life, who has suffered for music as much as loved it, and has grown to regard its technicalities as the very elements of his intelligence, that can perceive the true relationship between teachers and pupils, the duties of one to the other, and the demands of each from each, and can sympathize with such sensitiveness as seems to be little known and less considered by non-professional persons. The interference of a non-musician with the functions of any professor who would be true to his calling rather than flatter a man of station, would certainly and justly be resented, and the meddling of such a man with the studies or even the general discipline of the pupils might be feared and so deferred to, but would surely be ridiculed and so never respected.

It is required in the letter of Mr. Capes that the Principal of the academy should be "a man who would do for the education of musicians what Dr. Arnold did for Rugby," and heartily I accord in the demand; but Dr. Arnold accomplished his great work through his moral influence over the pupils, and through his modernizing the course of instruction to meet the spirit of the time: the former he acquired by constant personal intercourse with his own immediate pupils and by weekly lectures to the entire school, and the latter he achieved by knowing the deficiencies of the established routine and the neces-

sities that should supply them; had he been other than a scholar, he could not have taught scholars nor influenced them to their moral good, and had he been other than a master of the subject of education, he could not have improved its system.

It is advanced that none but a non-professor could be exempt from cliquism and party influence; whereas none are so prone as those who are unversed in a subject to the exercise of partisanship, to prejudice, and to persuasion. Every honest musician may, like all other honest men, be liable to error, and be more quick to perceive the merits of one teacher or of one method than of another, but he will have knowledge to direct his judgment, and the stake of his own character to control his interest, and this will be more trustworthy to his fellow-professors than any one who has no capability of judging and no professional reputation to compromise. It is proposed that such a non-professional chief "ought in the actual administration of the institution to be assisted by the advice of a council of the professors;" that is to say, a body of clever men, who know what is needed, and how this should be administered, are to prompt the puppet Principal with his acts of office, and he is to assume the credit of their suggestions, having the sole authority to enforce them. Such a plan may lead to the creation of a pleasant sinecure and a sounding title for some too fine a gentleman to master a subject or to undertake what he can understand, but is there reason in supposing that it could secure the co-operation of men of intellect and independence? I sincerely but regretfully believe that the shortcomings ascribed to the Royal Academy of Music are totally due to the non-professional element in its constituiion. This I assert with a full sense of the valuable exertions of those gentlemen in founding the establishment, and in obtaining for it the royal charter, of their generous liberality in contributing to its funds, and of the great kindness of some of them to members of the institution; but I have the strongest reasons for the opinion that the functions of such a body should definitely cease at canvassing for subscribers, and introducing talented pupils to opportunities for the exercise of their abilities.

It would be wanton to catalogue the heartburnings, jealousies, and minor vexations that have occurred among professors and pupils of the academy, which would have been easily conciliable by one in supreme authority who was of the same fraternity as the agrieved—nay, under whose primacy the majority of these could not have arisen, but which have in many cases been provoked by the well-meaning committee who had no professional sympathies to guide them. The crying evil of the present hour is this widely spread system of amateurism, which invests with dignities gentlemen who fill them with self-inflation instead of sterling ability, and who are placed in their positions from regard to their social standing instead of to their technical competency.

It must be accounted a serious oversight of the reformers of our Church, who laboured at the time when the profound study of music ceased to be limited to the priesthood, and was first sedulously pursued by members of the laity, that the office of precentor in our ecclesiastical establishments was continued as a priestly office, and not thrown open to men who should be educationally qualified for its discharge. The consequence is the present deplorable state of our national church music, at which all musicians groan, and through which the true edification that should arrive from music to all who frequent our churches is withheld; and this is because non-musicians have the control of music in all our church establishments. What would be said of the placing a physician at the head of a military college, a priest at the head of a school of medicine, a lawyer to superintend the training of theologians, or a soldier to direct the studies of painters? And yet, while the absurdity of either of these would be so monstrous that even to hint at them here I feel to be almost an indecorum, it has been seriously proposed and thoughtfully argued that a non-musician ought to be at the head of a musical academy. Evil too great it is that we must have amateur precentors, succentors, and sub-chanters, for, since they cannot serve two masters, they must be amateurs of either music or divinity. Much it is to be deplored that we may have amateur professors and amateur choristers; let it not be added to these cruel tokens of the ill esteem in which music is held, and of the crushing opposition that resists all the best impulses of the practitioners of a beautiful art to vindicate themselves and their calling, that it shall be legal to place any other than a professional musician as the chief of a national seminary for musical instruction, in which position, more than any other, the reputation, the example, the precepts, the insight, the fellowship, and the thousand direct and indirect influences of a thorough musician are utterly indispensable—I am, Sir, your obedient servant,

G. A. Macfarren.

Proceedings of Institutions.

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WHITBY.—Rev. W. Keane, M.A., *Chairman;* Dr. Dowson; Rev. J. Owen; Messrs. Stonehouse, J. Bate, and W. G. Chiesman, *Secretary*.

WIGAN.—Messrs. Richard Burland, Richard Leigh, William Melling, James Smalley, Thomas Wall, James White, Joseph Wilson, Robert Winstanley, and James Seward, Church-street, Wigan, *Secretary*.

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„ QUEENSBURY (HALIFAX.)—Mr. W. Foster, *President;* Messrs. A. Kershaw, Jno. Greenwood, and J. W. Quarmby, *Secretary*.

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PARIS EXHIBITION OF 1867.

The Committees of her Majesty's Commissioners on the following Groups have recently held meetings at the South Kensington Museum, and nominated Associate Commissioners for their respective Committees:—

Group II.—Apparatus and application of the liberal arts—Classes 6 to 13.

Group III.—Furniture and other objects for the use of dwellings—Classes 14 to 26.

Group IV.—Clothing (including fabrics) and other objects worn on the person—Classes 27 to 29.

Group VI.—Special Committee on Navigation—Class 66.

Group VII.—Food (fresh or preserved) in various states of preparation—Classes 68 to 73.

Group VIII.—Live Stock and specimens of agricultural buildings—Classes 74 to 82.

RAILWAY REFORM.

An article in Messrs. Travers' Circular, for March 17th, says:—

Immense importance attaches from two points of view to any steps which the Commission at present sitting may recommend to be taken with reference to the management of railways. First, the enormous amount of capital sunk in their construction is some measure of the number of persons whose fortunes are wholly or partially involved in their success. There is no other form of investment in which any injurious interference would affect disastrously so many thousands of people. But in the second place, railways, besides being the most popular of all forms of investment, are one of the most essential elements in what makes up the public convenience. Whatever proposals may be made will have, therefore, at once to do justice to the shareholders, and to add to the comfort and convenience of the general public at the same time. That the necessity for some movement is very widely felt scarcely needs proving. Neither those with money invested in railways, speaking of them as a class, nor those who do no more than use railways for the conveyance of themselves or their goods, are satisfied. The one quarrel with their dividend, the other with their accommodation, or, if not with that, with the price they have to pay for it. It may be worth while to ascertain the precise ground of these grievances before considering that almost revolutionary remedy which has been proposed for them—the purchase of railways by the Government. Even if this particular remedy may be thought too violent, there is no reason to drop the matter altogether, or to assume either that there are no substantial grounds for complaint at all, or that there is no means available for the removal of such grounds as there are.

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It will be well to enumerate in order and with distinctness the chief heads under which reform is palpably possible.

1st. *The differences in the fares on different lines.*—The difference between the passenger rate on the dearest and that on the cheapest line amounts to no less than 450 per cent. The cheapest company will carry you a hundred miles, first-class, for five shillings, while the dearest will charge you £1 9s. 2d., and the average charge is 16s. 8d. The two extremes for first-class travelling are ½d. and 3½d. per mile; for second-class, ½d. and 2d.; and for third-class, ½d. and 1½d. The average excursion fare is about one-third of the ordinary traffic fares. Why should one pay very nearly six times as much for travelling in one part of the country as one pays in another? Whence does the extra cost arise? From the more expensive construction of the line which charges you most? No; because, as a rule, the lines which have cost the most to construct, have charged the lowest fares. From the want of means to accommodate more passengers, that is, from a limited supply of accommodation? No; because, as a matter of fact, the trains do not carry one-tenth of the number they are capable of carrying.

2nd. *The differences between charges for passengers and charges for goods.*—No aspect of the question is more important than the goods traffic. The whole gigantic commerce of the country is checked or encouraged, as the case may be, by the railway charges for freight. Of the thirty-one million pounds which found their way into the coffers of the companies in 1863, sixteen and a-half millions, or more than half of the whole sum, were paid by merchants and tradespeople for the conveyance of merchandise. First let us look at freightage as compared with fares. The average fare for a passenger, (who would not generally weigh more than one hundred weight and a half), travelling over 100 miles, is 16s. 8d., 12s. 6d., and 7s. 6d., according to class. The average charge for a ton of coals over the same distance would be £1 0s. 10d. Compared with passengers it will be seen that coals are carried cheaply; but the conveyance of coal has been justly said to bear to general goods traffic the same relation as excursion traffic to ordinary traffic. The points raised by the price of coal conveyance are these. Why should a second-class passenger be charged more than half as much as a ton of coals, more particularly as he loads and unloads himself, which coals do not? If coals, again, can be carried at this rate, why should other goods be charged at nearly twice as much? As we shall presently see, the rate for coals is enormous when set against the actual cost. But even for coals the present charges are far too high, and one most obvious effect of the system is that manufacturers will be driven away from the present positions into the coal fields, and the industry of the country will, so to speak, be congested in certain districts. It is reported that many trades are leaving Birmingham and going down to the coast, on account of the price of the conveyance of the raw materials by rail. Why should not railways confer the same benefits as navigable rivers conferred, and railway towns be all but as well off, for importing and exporting purposes, as if they were on the

coast? Why should not prices be more widely equalised? That this is not the case will appear all the more extraordinary when we come to the actual cost of transit.

3rd. *The mysterious irregularities in the rates for goods.*—Nearly every article of commerce has a separate rate of charge. A hogshead of sugar is charged at a different rate from a barrel of currants. Stone for repairing roads is 1½d. a ton a mile; stone for building is 2½d. Commodities apparently giving just the same trouble, and involving just the same risk, are charged at widely different prices. Then, on the other hand, why should I have to pay the same for a 4lb. parcel as for a parcel of a hundredweight? If any reader should wish to see these things for himself, he need only spend the next half-hour he is kept waiting for his train in examining the tariff in the booking-office.

4th. (And this is the most wonderful of all).—*The difference between the price and the cost, between the charge made by the companies, and the expense incurred by them.*—The average cost of all the trains per mile in the kingdom amounts to two shillings and sevenpence. This includes all the ordinary expenditure involved, indirect as well as direct, but, of course, makes no allowance for profit. Let us begin with goods. A full load may be taken, according to Mr. Galt's calculation, at 200 tons, inclusive of engine, tender, and trucks. The cost of carrying 100 tons of goods for a mile would be therefore 1s. 3½d. The charge would vary from 12s. 6d. up to £1 17s. 6d.! The same sort of discrepancy is seen in the case of passengers. The average number of passengers in a regular train may be put down at fifty. If there were a thousand of them, each could be carried 100 miles at an average cost of 3¼d. But as the average is only fifty, each is carried at twenty times this cost—that is, at 5s. 5d. But he has to pay, on an average of all the lines in the country, 12s. 6d. if he travel by second class, and 7s. 6d. even by third-class. The train, be it remembered, costs 2s. 7d. per mile, however many or however few it carries, provided it be not an express, in which there is much more wear and tear; provided, also, the locomotive be of the average power, and the line have fairly good gradients. It will be well here to notice an objection which may be made to this reasoning by people who only view the matter from their side. There is this tremendous margin, they may say, in order to make up the profits on the original capital. The capital invested is so tremendous that a margin of this sort is necessary to remunerate the proprietors. But a moment's thought may convince anybody of the difference between the profits in a business and the interest furnished by these profits on the invested capital. The average earnings of a train per mile in Great Britain and Ireland are 5s. 6d. against an expenditure of 2s. 7d.—that is, the profits on the working are rather more than 100 per cent.; but, as is well known, the average profits resulting from this upon the invested capital are only 4 per cent. But let us suppose the present fares were reduced. It has been proved that the increase in the number of passengers when fares are reduced to a low point is out of all proportion to the reduction in the charge. And were the fares reduced to a third of their present cost not only would the railway companies rapidly recoup their sacrifice, but, what is far more important from a public point of view—three times as many people could afford to travel, and a great benefit would thus be bestowed on the nation at large. The difference to the shareholders between a very high and a very low tariff, even when the experiment of low rates has been tried for a short time, is never more than 1 per cent., and the immense significance of this fact will be evident when we come to consider the advisability of turning all the railways into a national undertaking.

THE CATTLE DISEASE IN FRANCE.

The cattle disease has appeared in France, as well as in other countries, but its effects to the present time have been extremely insignificant, owing, as some people say, to the extreme attention paid by the Government at the first moment of its appearance. We have no returns before us later than the commencement of December; but at that time the number of cattle lost by the epidemic in question was stated officially to have been only forty-three, in the two departments of the Nord and the Pas de Calais. The disease has, however, appeared in Paris, at the Jardin d'Acclimatation in the Bois de Boulogne, which has lost thirty-five animals by it, including gazelles, stags, a female urus of Lithuania, and a peccary. M. Bouley has presented a memoir on the subject to the Academy of Medicine of Paris, in which he declares it to be proved, not only that the disease is essentially contagious, and may attack all kinds of ruminating animals, great or small, indigenous or exotic, but also man himself. At any rate, he believes that beyond question it may and has been transmitted by man. A stag in the gardens of the Society, confined at a considerable distance from the building in which the disease existed, was attacked by it and died, in consequence, as supposed, of the same attendant having the care of the animal in question as well as of those which had been previously attacked. It cannot be said that a single case of this sort can be quoted as positive proof; in fact, it would be most illogical to consider it so. The epidemic is said to have been imported into the gardens in the Bois de Boulogne by two gazelles brought from England, but no suggestion is made as to the manner of its appearance in the two departments already named. The Minister of Agriculture has extended the regulations, adopted in September last for checking the spread of the disease, to all kinds of animals, with the exception of horses, asses, mules, and dogs.

The Imperial Government sent a veterinary surgeon to England to study the question; and that gentleman has published his opinions respecting the conduct of the English authorities and men of science, who, he says, might have arrested the disease had they taken the advice which he offered them. We have not seen any account of the means proposed by the surgeon in question, or we should make it our business to publish it, as it is extremely important to know what are the opinions of practical foreigners upon the subject. There is no doubt that the French authorities are extremely vigilant and active in such cases; and that which happened in the instance of the first gazelle that died in the Jardin d'Acclimatation is a proof of it. There was no suspicion of the cause of the animal's death at first, and the body was given over to a stuffer; when the disease reappeared, and its nature was revealed, an officer, M. Bouley, we believe, was instructed to trace the remains in order to ascertain whethey they had communicated the disease on their road; the attempt, however, was fruitless; the skin was found in the possession of the stuffer to whom the body had been delivered, but all the rest had been carried away by a *chiffonnier*, who, upon being interrogated, declared that he had thrown it on a heap of rubbish, on a waste spot on the outskirts of the town, and no trace of it could be discovered. It is extremely fortunate for France that the disease has at present exhibited so little power, and the care and intelligence exhibited by the authorities is most praiseworthy; but the atmospheric condition, or some other circumstance, may be different in the two countries. The potato disease and the grape disease ought to make us modest respecting the power of our science in such cases. But there is another disease, viz., the *gattine*, which has attacked the silkworms, which affords a still more striking example. This epidemic, or something very similar to it, has visited France three times in less than a hundred and fifty years. On a former occasion it lasted about sixteen years, and caused the destruction of an immense number of mulberry trees, under the impression that the production of silk was ended in France. On the present occasion the *gattine* has raged for about twelve years. It has reduced the poor silk

worm rearers to the most miserable condition; it has caused the mulberry tree farmers to talk of rooting up the trees, in order to make place for a profitable crop; and there is no doubt that in many cases they have done so. It has given rise to the importation of Chinese and Japanese silks to an enormous extent; it has caused the introduction of Japanese silkworms' eggs, the cards of which are sold for about twenty shillings, whereas in ordinary times French eggs are worth about a tenth part of that sum; it has greatly increased the price of all silk goods; it has disarranged the whole of that enormous trade; in short, to quote the words of a senator, it has risen to the importance of a national calamity. The Government has issued more than one commission on the subject; the Senate has been occupied with the subject upon two occasions; eminent chemists, entomologists, silk-growers of long practice, and other practical men, have been engaged on the inquiry and in attempts to find a cure for the disease for years; and yet at the present moment, not only are no means found for its prevention, but scientific authorities, as well as practical men, disagree as to its origin, some believing that it originates in the worm, some that it is a result of a deterioration of the mulberry tree, and others that it is the effect of a combination of circumstances, or, perhaps, atmospheric phenomena. It is said that there are symptoms of a decline in the disease, and, should it disappear, it will be an instance of an epidemic appearing for the third time, extending over all Europe and parts of Asia, and baffling science and art, not for one, but for more than a dozen years.

FRENCH OFFICIAL REPORT ON PUBLIC WORKS OF UTILITY AND DECORATION FOR THE YEAR 1865.

The Imperial Government publishes annually a very interesting exposé of the situation of the empire, which contains, amongst other matters, an account of the public works that have been executed during the year. The following is a summary of the items of most general interest:—

Agriculture.—During the first eleven months of 1865 France sent 25,948 head of cattle to England; and exported to all countries during the same period 17,850 tons of butter.

Cattle Disease.—This infliction has disappeared in France since the 5th of November, the number of cattle lost amounting only to 43 head.

Guano.—In consequence of treaties entered into with the Peruvian government, a supply of this manure has been placed at the disposal of small farmers without passing through the hands of intermediate agents.

Water Communication.—The line of navigation between Paris and Strasbourg has been completed by the canalization of the River Marne. That between Paris and Lyons will be finished next year. A system of weirs has been adopted with success on the Rhone between Lyons and Arles. The salt water canal of Saint Louis, intended to provide a better means of communication than the natural mouths of the river, has been commenced, but the works have been stopped by the appearance of an epidemic amongst the labourers.

Sea Ports.—Important works are in progress at Marseilles, Havre, Bordeaux, Dunkirk, Boulogne, Dieppe, Saint Nazaire, Brest, and Saint Malo. At Marseilles the additions have been so large that, at the end of last year, the port possessed 225 acres of water, and nearly five miles of quays. At Havre the channel has been greatly improved, and the second breakwater, with other improvements, are expected to be completed in the present year. At Brest a new port, called Port Napoléon, has been formed, and includes a basin which communicates with the town on one hand, and with the railway on the other. This work has been pushed on with great vigour, the town of Brest having lent the Government four millions of francs for the purpose. The port is protected against the sea; the transatlantic packets will shortly be able to enter within the port, which is now being deepened by dredging machines, and a floating basin is being planned.

Beacons.—There are at present on the coasts of France 982 beacons in wood or iron, 151 in masonry, 483 buoys, and 379 land-marks.

Electric Lights have been definitely established in the two light-houses of the Hève, near Havre. The intensity of each of these new lights is estimated as equivalent to 5,000 carcel lamps, and it may be increased twofold, with little additional cost, whenever the condition of the atmosphere requires it.

Reclamation of Land.—The works undertaken for the reclamation of the Landes have been carried on with vigour, and at present nearly half-a-million of acres have been made available for cultivation; a further quantity, equal to about a quarter of that area, is now being drained. The sum expended in drainage in all France to the end of 1864 is estimated at less than two millions sterling, and the increased value of the lands in consequence at more than three times that amount in capital, and about half-a-million in revenue. The quantity of land drained increases about one-tenth per annum on an average.

Fine Arts.—The number of works of art acquired by the state, and distributed amongst the various museums and establishments, was equal to that of any previous year. Amongst the acquisitions specially named are several pictures of military events in Japan, Cochin-China, and Mexico, and a number of portraits of historical personages; a statue of Portalis for the *Conseil d'Etat*; two statues for the completion of the fountain de Medicis in the Luxembourg Gardens; a large number of statues in stone and marble for the niches in the court of the old Louvre; and several busts of celebrated persons, including, it may be mentioned, one of Richard Cobden, for the gallery at Versailles.

Intaglio Engraving.—An important part of the funds at the disposal of the Government has been employed in the encouragement of the art of engraving on precious stones and die-sinking, as there appeared great danger that, without such aid, these arts would be almost abandoned.

Restoration of Public Monuments.—Amongst the most important works of this class now in hand are mentioned the restoration of the church of Saint Denis; the reconstruction of the Chateau of Pierrefonds; the completion of the beautiful decorations of the *Salles des Etats*, in the Chateau of Blois; and the repair of more than twenty ancient ecclesiastical edifices in the departments. In addition to these may be mentioned especially the restoration of the Chateau of Saint Germain, which is to contain a museum of Gallic and Gallo-Roman antiquities, which is approaching completion; the recent decoration of the theatre of the Conservatoire; the recovering of the great dome of the Invalides; the reconstruction of parts of the galleries of the Louvre and of the palace of the Tuileries; the completion, now under hand, of the buildings of the Conservatoire des Arts-et-Métiers; the New Opera House; and the rebuilding of the Hospital of the Hôtel Dieu, just commenced.

Public Education.—Several improvements have been introduced in the primary Normal Schools, which now have gardens attached, in which the pupils are encouraged to study horticulture. Music is also now taught in these schools, and means for meteorological observations provided. At the end of each collegiate year conferences take place, when the directors address the pupil teachers on the duties of instructors. The establishment at Cluny of a Normal School for special instruction has already been specially noticed in this *Journal*; it appears that 58 scholarships have been created by departments, towns, and private individuals, so that the nucleus of the school is secured. Another important circumstance is the establishment of free courses of superior instruc-

tion. It appears that 876 courses have been opened, of which 296 are in Paris. Of these courses, 194 have been established by learned societies, 256 by the prefects or municipal authorities, 12 by chambers of commerce or notaries, 19 by industrial societies, and 395 by private persons.

Coast Fisheries.—This industry has been materially developed. In 1864 it employed 15,428 boats, with an aggregate of 81,337 tons, and employing 56,306 men, being an augmentation, as compared with the preceding year, of 158 boats, 3,629 tons, and 1,106 fishermen.

Life-Boats.—A society for the saving of life at sea was established by decree in November last, and will shortly possess fifteen life-boats. The Empress is the patroness of the new society.

Navy.—The additions made to the new fleet during the past year consist of three armour-plated frigates of 1000 horse-power; one corvette and one coast-guard ship plated, and one corvette not plated, each of 500 horse-power. The steam-vessels being built or fitted amount to 11, of 7,050 horse-power, afloat, and twenty-eight on the stocks.

Naval Ports.—At Cherbourg the submarine works for the Fort Chavagnac and the lines of rails connecting the arsenal and the workshops have been completed. At Brest two large repairing docks have been formed. The port of Lorient has been deepened. The complementary works of Fort Bayard at Rochefort have been finished. At Toulon the repairing docks of Castigneau have been terminated, and many other important works are now in hand.

PROPERTIES OF NITROGLYCERINE.

The *Berg-und-Hüttenmännische Zeitung* says:—

Nitroglycerine has been known to science nearly twenty years. It was discovered by the Italian Sombrero, in Pelouze's laboratory in Paris. The Swedish engineer, Alfred Nobel, was the first, however (in 1864), who turned it to practical account.

Properties of the Blasting Oil (Nitroglycerine).

1. Nitroglycerine is a light-yellow oily liquid.
2. Its specific gravity is 1·6.
3. It is insoluble in water.
4. Direct contact with fire, as, for instance, with a lighted match, does not cause it to explode.
5. The oil will only explode under certain circumstances, and it then burns away, leaving no residue.
6. It possesses great rapidity of explosion.
7. It can be kept for any length of time without losing in weight or in goodness.
8. It detonates on being struck with a hammer.
9. It can be heated without danger to 212° Fahr., but explodes at 356° Fahr.
10. It is poisonous, and causes violent headaches, which soon, however, pass off.

It may be proved, theoretically, that nitroglycerine is stronger than gunpowder; for not only does its decomposition give rise to a larger volume of gas, but as the gas will be at a higher temperature than is the case with powder, we get a still greater effect. It has been calculated that nitroglycerine has thirteen times the strength of an equal volume of gunpowder; eight times the strength of an equal weight.

Advantages of Nobel's Nitroglycerine.

1. Considerable saving of labour in boring the holes for blasting. A small hole with the nitroglycerine will do as much work as a large one with gunpowder.
2. Greater cheapness than powder, when power is taken as standard.
3. Blasting work can be done in a shorter time.
4. The fact that it leaves no residue after the explosion. This is important in working rock salt.
5. Great rapidity of explosion, which permits the nitroglycerine to be used with advantage in loose rocks with many joints, where powder would have scarcely any effect.
6. The absence of danger in carrying it and storing it in virtue of the properties described in (4.) and (7.)
7. The fact that solid tamping is not required. This saves time and expense, and lessens the danger.
8. Holes in watery places and under water can be easily charged. This advantage depends on the insolubility and specific gravity of the oil. All that is needed is to pour the oil by means of a tube into the hole covered with water. It sinks to the bottom, and the water above it does for the tamping.
9. It will blow to pieces lumps of metal.

Disadvantages.

1. The necessity of using cartridges for horizontal holes, and those sloping upwards.
2. In rocks that are much jointed, cracked, or cavernous, the bore holes must be made tight, in order to prevent the oil running out.
3. The effect on the nervous system and respiratory organs. The gases formed by the explosion cause headaches, and even sometimes vomiting. This is a hindrance to its employment underground, but is of little importance in quarries. The inventor is of opinion that it is not the gases formed by the explosion, but rather fine particles of the blasting oil, that are scattered about, which do the mischief.

Fine Arts.

Juries, election of, for the Paris Annual Exhibition of the Works of Living Artists.—The Juries for the Exhibition which opens, as usual, on the 1st of May, have recently been elected. The whole body of artists who have gained prizes vote for the juries in their own class, and the result of the experiment, now three years old, has been most satisfactory; the list of the new juries for painting, and sculpture with medal engraving, will fully justify the new system. Painting:—MM. Gérome, Cabanel, Pils, Bida, Meissonier, Gleyre, Français, Fromentin, Corot, Robert-Fleury, J. Breton, Hébert, Dauzats, Brion, Daubigny, Barrias, Dubufe, Baudry; with Isabey, de Lajolais, and Th. Rousseau as supplementary members. The list includes all the professors of the Ecole des Beaux Arts, and several members of the Academy, and, in fact, represents fairly all the sections of the artistic world. The Sculpture Jury consists of:—MM. Guillaume, Dumont, and Jouffroy, all three professors of the school, as well as members of the Institute, MM. Barye, Cavelier, Perraud, Daumas, Cabet (eminent artists), and M. Paul Dubois, who won the grand medal of honour last year for his beautiful statue of the Young Florentine Singer. The other juries are equally satisfactory in their composition. There is, moreover, a great advantage gained by the present mode of election, namely, that while under the old system there were all kinds of complaints and charges made against the juries—under the new one there is only one fault found, which is that the artists are not suffiently ready to exercise their franchise.

Encouragement of Art in Belgium.—There is, perhaps, no country in Europe in which art stands higher at the present moment than in Belgium; and King Leopold II. has already evinced his interest in the subject by the announcement of the following subsidies to the academies of the following cities and towns:—Antwerp, 8,600 francs; Ghent, 5,400 francs; Liege, 5,400 francs; Bruges, 5,300 francs; Brussels, 5,000 francs; and Louvain, 3,000 francs. The quantity of works of art to be sent to the Paris Exhibition next year is so large, that the Belgian Commission has sought and obtained permission to construct a supplementary building in the park for their reception.

An English Art Patron at Bordeaux.—Mr. T. R. Scott, late her Majesty's Consul at Bordeaux, who died a short time since of congestion of the brain, was an eminent amateur and patron of art and artists, and Pre-

dent of the Société des Amis des Arts of that town; ıd it is admitted that it was principally due to his :ertions that the acquisitions made for the local useum, out of the annual exhibitions held there, be- .me more and more important every year. It is agree- ıle to note this fact in connection with one of our own ›untrymen.

EXHIBITION OF WORKS OF ART AT PAU.—Local ex- .bitions assume more importance every year in France; ıat organised by the Société des Amis des Arts at Pau, ı the Pyrenées, closed last week, and the report is very tisfactory; the number of works sold was forty-three, .cluding works by several eminent painters, and nounted to about one-sixth of the whole that were for le. Such a result in a town so remote, and of such nall importance as Pau, says much for the dissemina- on of artistic taste in France.

Manufactures.

IRON AND STEEL PRODUCTION IN AMERICA.—The pro- ıcers of iron and steel in the United States held a quar- rly meeting at Washington City in March. After an ldress by the President the secretary read a report, from hich it appears that the production of anthracite on was, in 1864, 684,018 tons; in 1865, 479,558 tons; ›crease in 1865, 204,460 tons. Of raw coal (bituminous) ıd coke pig-iron there was made in 1864, 202,171 tons; ı 1865, 179,007 tons; decrease (mainly in Ohio) ,164 tons. Of charcoal pig-iron there was produced ı 1864, 244,091 tons; in 1865, 252,390 tons; increase, 299 tons; total production of pig-iron in 1865, 10,555 tons. Of bar-iron there was rolled as follows:— ı 1864, 852,378 tons; in 1865, 833,049 tons; decrease, ,329 tons. Of rails, including those re-rolled, there ere made in 1865, 353,017 tons, or about half the capa- ty of the mills. Of steel there was made in 1865 ainly in Pennsylvania) 15,872 tons.

MACHINERY IN PRUSSIA.—There were manufactured ; Elbing, in 1864, one iron steam-dredging machine of xteen horse power, and one of twenty-five horse power; ıe wooden ditto of sixteen horse power; one iron tow- g steamboat of sixteen horse power; one steam-en- ıne of fifty horse power, with boiler and iron sledge for edging-machine; two steam-engines, twenty and elve horse power; one screw-machine with boiler, elve horse power; three Woolf's steam-engines, to- ther sixty-four horse power; four ditto, twenty horse ›wer; one high-pressure machine, of ten horse power; enty-three locomotives; five large boilers for ships; ndry boilers for distilleries and other establishments; x steam-mills for sawing timber, and eight ditto for inding corn; five hundred and forty-eight threshing achines; three hundred and seventy-three for cleaning rn; six hundred and forty-two chaff-cutting machines; ur stationary engines; forty-seven sawing machines; n machines for digging peat. The manufacturers used raw material, 21,800cwt. of raw iron; 10,200cwt. of rged iron; 336cwt. of copper and brass; 425 lasts of als; 227 lasts of coke. The establishments employed ven hundred to eight hundred workmen. A new estab- shment for the construction of iron ships and machines projected. All the firms get a considerable number of ders from even as far as Siberia and Russia. In the rgest factory in Berlin there were one hundred and irty-four locomotives built with tenders, of which enty-four were on Russian account for the Odessa ıskany Railway; two for a Dutch company to India; ıd eight for the Lubeck-Berlin Railway Company.

Commerce.

SAFETY OF SHIPS.—At the close of the meeting of the ıstitute of Naval Architects on Saturday last, Mr. Reed, the Chief Constructor of the Navy, proposed, and Mr. Scott Russell seconded, the following resolution:—"That in the opinion of the members and associates of this insti- tution, it is desirable that an early meeting of council take place for the purpose of considering, with reference to the president's opening speech, and the papers that have been read on the security of iron ships, what recommendations could be offered to the public in order to prevent as far as possible the loss of passenger and other vessels." A debate ensued, in which the details were briskly dis- cussed, but with a unanimous feeling that it was incum- bent upon the shipbuilders of this country to take imme- diate steps to make it understood that they felt the importance of calling the attention of the profession to the necessity of re-considering the measures taken to se- cure the safety of life at sea, with reference not only to passengers, but to seamen, and in view of the great loss of life which has recently occurred in the *London*, the ob- scurity attending the actual cause of this disaster, and the doubt attending the question of whether the deck fittings and boat arrangements of even a first-class ship are at all satisfactory, raising a painful feeling in the minds of those present. The resolution was strongly supported by Sir John Pakington, the president, and was finally carried without a dissentient voice. It is under- stood that Lloyd's committee have called upon their surveyors for advice upon the same subject.

AMERICAN MINERAL RESOURCES.—Mr. H. Greeley, in an address delivered at the American Institute, referring to the above subject, said:—"We are now producing somewhat less than 100,000,000 dols. of gold and silver per annum from our mines, which is more than the annual product of the whole world forty years ago— probably more than was produced in the palmiest days of South American and Mexican gold mining. Yet, large as the amount is, it is not a beginning. That it will be trebled within the next ten years, provided our great Pacific Railroad shall meantime be completed, few will doubt who have any acquaintance with the facts. I trust the attention of the institute will be given to this vast and growing interest—that we shall be able in some way to aid its development—and that in time the most complete and instructive cabinet of American minerals in existence will be that of the American Institute. I would have specimens of the precious metals from every locality; but not of these only. There should be some place where the chemist, the prospector, the mine owner, the metallurgist, could compare critically the iron ore of Lake Champlain with that of Western Connecticut and that of Lake Superior, so as to determine wherein they agree and wherein they differ. In the first great World's Exposition of products at London, 1851, I was not asked for specimens of California gold, but the most eminent authority in British geology asked me for samples of our Lake Superior iron—then newly dis- covered—and I was able, on my return, to obtain and send them. I would like to say more of the prospective development of our mineral wealth. Having traversed the great mountain chains and high plains and valleys of our continent, I feel sure that their treasures of gold and silver exceed all estimate, all calculation. I quite understand that gold and silver, like iron or coal, must be paid for—that he who digs them from the earth pays usually quite as much as though he obtained them by farming or trade—and yet I feel that our country is richer for her mines, precisely as she is for her soil. They furnish employment for labour, and create markets for every other department of industry. As yet, I pre- sume, all the gold and silver dug from the Rocky Mountains have cost all they are worth; but the Pacific Railroad will reduce the cost of their production one- half, while opening vast markets for the food and fabrics of our older States."

POTATO SPIRIT.—For some years there has been a regular sale to England of this spirit from Berlin factories, used for the adultertion of wine and brandy in bond; and it is stated that if spirits of wine were admited into

England under less disadvantageous circumstances, the sale would be considerably larger. Large quantities are sent to Hamburgh, Lubeck, Denmark, Switzerland, and Bavaria.

THE SARDINE FISHERY at Nantes, last year, was so abundant that 700 tons of salt were employed in salting the fish taken.

ESPARTO GRASS FOR PAPER.—The import of this raw material continues to increase. Last year the imports were 51,522 tons against 19,190 tons in 1853. Mr. West, the British Secretary of Legation at Madrid, says "this grass, which grows wild in almost all parts of Spain, resembles very much the common spear grass which is found on the sandy sea shores of Lancashire. Its botanical name is, I believe, *Stipa tenacissima*. It has long been used in Spain for making matting, cord, baskets, &c., and appears to have been used for such purposes by the Phœnicians, who gathered it in large quantities from the coasts of Spain. It was not, however, until lately, that its adaptability for paper-making was discovered, and that its value in consequence became so much greater." Mr. Consul Mark informs us that 160,000 tons were imported into England from the Spanish and African coasts last year (1864.) Mr. Consul Turner reports that "large quantities are shipped from Carthagena, and that in 1863 it was selling for the fabulous price of £4 to £10 per ton. It appears, however, that in the districts where it is most abundant there is great difficulty in getting it to the coast for shipment, and that oftentimes the expense of transport would exceed the cost price of the article. I am told that no less than 80,000 women and children are employed in the country between Alicante and Carthagena in the production of articles made from this grass, and that it is shipped in large quantities, in a prepared state (Esparto labrado), to both France and England." Mr. Vice-Consul Mark reports that "although not much attention has hitherto been given to the Esparto grass in the district of San Sebastian, he is of opinion that now that communication with the interior is made easier, shipments will take place, both at that port and at the neighbouring one of Passages. Its cultivation has never been tried, but there seems great probability that the qualities of the stalk would be greatly improved and its size increased, whereby its value would be greatly augmented for all purposes. It grows where no other plant will grow, and is most abundant near Almagrera, growing on the igneous mountains and amid sterile rocks."

FRAUDULENT TRADE MARKS.—In a recent report on the trade between Great Britain and Russia, by Mr. Mitchell, are the following remarks on forged trade marks:—"The business of Sheffield houses with Russia is seriously injured by the sale of common goods made in Prussia, and stamped with the Sheffield trade marks. The treaty with the Zollverein has not removed this evil, because it protects the name of the Sheffield manufacturer only, and not his work, whereas it is by the mark only that purchasers and consumers are influenced to buy. Iron goods are manufactured in large quantities with English marks and labels at Hagen, near Dusseldorf, on the Rhine. Thus the sickles, files, and saws, imported into Russia from Germany under English names, are very inferior goods, but much cheaper than those manufactured at Sheffield. Great quantities of German goods, known in the trade as "Dutch goods," and marked "J. K." (John Kinnear), enter Russia, and are sold twenty per cent. cheaper than the goods of the manufacturer whose well-known trade mark is thus fraudulently imitated. The imitation of foreign trade marks is extensively pursued in Russia also. In the case of plane-irons, for instance, wholesale dealers order the cut-iron in England, and the other in Tula, and affix the name of an English manufacturer. Very good cutlery is made at Pavlova, in Russia, and is frequently sold as the produce of Sheffield in shops which profess to sell nothing but English wares. The Russian public always insist on English trade marks in cutlery. The differential duties in favour of the land frontiers are a premium on the importation of Prussian common goods stamped with Sheffield and other English trade marks.

Obituary.

MR. BARNETT BLAKE, Secretary of the Yorkshire Union, and visiting officer to the Society of Arts in that district, died of typhus fever on Wednesday, the 14th March. He was seized with illness about nine days previously, but his death was heard of with feelings of surprise even by his most intimate friends. In 1856 Mr. Blake was appointed Secretary to the Yorkshire Union of Mechanics' Institutes, on the resignation of Mr. Phillips. He had at that time long been connected with Mechanics' Institutes—was, indeed, a leading member of the Southwark Literary and Scientific Institution twenty years previously. From 1843 to 1852 he was editor of the *Exeter Gazette*, and during five years of that period secretary to the Exeter Literary and Scientific Institution. He was also a member of the Council of the Western Literary Union, comprising all the literary societies in Devon and Cornwall. From the date of his leaving Exeter to that of his appointment as secretary of the Yorkshire Union, he was editor of the *Liverpool Standard*. He had been a successful competitor for several prize essays, and he was otherwise known as an author. He was unanimously chosen to the office, and his energy and business habits have been of the greatest service to the Union. Year after year that service has been acknowledged at the Annual meetings of the Association, but it is now perhaps that its greatness will be truly felt. The ability, earnestness, and fidelity which Mr. Blake manifested in the discharge of his duties were as remarkable as the amount and variety of his labour. As agent and lecturer to the Union he had to travel over the whole of Yorkshire to lecture or speak at the meetings of the various institutes when required, and to confer with their officers when his advice was needed. He took a deep interest in the educational department of these Institutions, and superintended year after year from their commencement the middle class examinations in connection with the Universities of Oxford, Cambridge, London, and Durham, and those of the Society of Arts, all conducted under the auspices of the West Riding Educational Board, of which he was secretary. One of these examinations was, indeed, being carried on during his illness, and his absence was severely felt. His energy and zeal in all the good works in which he took a part were aided by eminent abilities. He was a clear, fluent, and interesting speaker and lecturer. His information was extensive, accurate, and ready. His loss will not soon cease to be deplored, not only by the institutions whose success he was so anxious and able to promote, but by the Society of Arts, whose educational work in the Yorkshire district he carried out so efficiently, and he will be especially missed at the annual conferences of the Institutions, in which he always took so prominent a part. Mr. Blake, who was fifty-four years of age, was married, and has left a family.

Notes.

HIGHLAND SOCIETY.—DEATH OF THE SECRETARY.—The *Gardeners' Chronicle* announces the death, on Wednesday last, of Mr. Macduff, the recently-elected secretary of the Highland and Agricultural Society, who had but just entered on the duties of the office lately resigned by Mr. Hall Maxwell, C.B.

OIL SPRING IN CANADA.—The *Oil Spring Chronicle* of Canada West says that an extraordinary oil well has just been discovered. It yielded on the 21st of February

259 gallons of oil in one hour, which was at the rate 1,692 barrels of 32 gallons each a day.

POST AND TELEGRAPH SERVICE COMBINED.—The ...ectors of the post-office and of the telegraphic ...ablishment of France have conceived the happy idea ...making the former aid the latter in outlying or other ...ces where it would not pay to establish a telegraphic ...ce, and it is said that all the necessary arrangements ... been made, and that the new system will be put in ... very shortly. In fact, the matter is so simple ... there is but little arrangement necessary. Persons ...ing out of reach of a telegraph office will merely have ...attach a sufficient amount in postage or special stamps ... the message they wish to send, and place the whole in ...envelope, only stamped for the postage, and addressed ... the nearest telegraph station, whence it will be de-...tched to its destination. A special envelope or label ...ill facilitate the sorting and consequently the delivery ... dispatches. It is not probable that the business ... under the new arrangement will be very large, ... will certainly accommodate a few persons, who at ...nt are almost entirely deprived of the use of the ...graph.

...-HOUSES IN AMERICA.—An American paper states ... the ice-house of Lyman R. Lyon, at Lyon's Falls, ..., has not been empty for twenty years, nor has a ...d of ice been put into it. The building is constructed ... the ordinary method, and when it is designed to ...it, a rose-jet is placed upon the water-pipe, and as ... water comes through it is chilled and drops into the ...ouse, where it forms in one solid mass.

...SUMPTION OF FOOD AND MATERIALS IN PARIS.—The ...ire of the *Bureau des Longitudes* for 1866, a small ...me of great utility as an authority on all matters ...ected with money, weights, measures, and statistics, ... the following account of the food and materials ... by the 1,696,141 inhabitants of Paris during the ... 1864:—

......	2,882,629 hectolitres	=	63,527,838	gals.
......	113,365 „	=	2,494,030	„
... and ...ry	76,000 „	=	1,672,000	„
......	340,308 „	=	7,486,776	„
......			15,098,796	lbs.
...ers' meat killed			223,093,524	„
„ „ brought in			37,112,446	„
... of all kinds			15,908,418	„
...uterie, cooked ham, sau-sages, &c.			3,600,548	„
..., patés, &c.			225,858	„
...se to the value of			£531,650	
...ers			£96,396	
...h water fish			£57,594	
„ „			£531,750	
......			£952,633	
...er			£1,087,805	
......			£558,275	
......			10,877	tons
......			8,446	„
...od			708,555	stères.
...rcoal, about			13,000,000	bush.
..., coke, peat, &c.			695,138	tons.
...e, cement, and plaster			120,500,000	bush.
...gh stone			592,371	cubic mètres.
...n „			249,455	„
...ble and granite			5,680	„
...ught iron			26,204	tons.
„			16,688	„
...e			7,684	„
...ks			23,841	„
...es			896	„
...oring tiles			4,197	„
...llow tiles for flooring and partitions			12,922	„

TRICHINES.—The Paris Academy of Medicine has turned its attention to the epidemic of the trichines, and M. Delpech has been desired to make a report on the pork in the markets. The public has taken alarm at the reports in circulation, and await the scientific examination with anxiety. M. H. Bonley said some time since, in a discussion at the Academy, that the trichine is killed by a temperature of 60° to 70° centigrade, that is to say 140° to nearly 160° Fahrenheit, and he added that the use of the meat thus attacked was without danger in France, as pork was not eaten raw; but that in Germany the case was different, as a very small amount of cooking was there applied to it, and that sometimes it was eaten after very incomplete smoking. Hence, according to M. Bonley, the propagation of this terrible malady. He explained that in the case of underdone meat the outer surface was often raised to 80° or 100°, while the interior did not exceed 50°, but that when pork was well roasted the temperature was always sufficient to kill the trichines. Accounts from Germany, however, throw serious doubts over the above statement. It is said that the disease has appeared at Prague, and that persons attacked with it have declared that the pork they had eaten was both smoked and cooked.

STENOGRAPHY IN FRANCE.—The use of shorthand writing is less diffused in France than in any civilized state; the habits of the country and the form of government accounting for this peculiarity. When, in 1860, complete staffs of shorthand writers were required for the Senate and the Corps Législatif, the greatest difficulty was experienced in their formation. A petition has recently been presented to the Senate by M. Martin, stenographer to the Corps Législatif, advocating the introduction of the teaching of shorthand writing into the college courses. M. Martin dwells upon the general diffusion of the art in England and Germany, and upon the inferior position of France in this respect. The Senate received the petition with favour, and referred it to the Minister of Public Instruction for his consideration. In the legislative bodies and in the courts of law a shorthand writer is rarely seen, and although some students make use of stenography in taking notes of the lectures they attend, its use is certainly extremely limited. None of the regular journals have a staff of shorthand writers, nearly all the reports being derived from official reports, either supplied by the authorities or published in official or semi-official journals. This is especially the case with regard to judicial proceedings, no one, except those officially authorized, being allowed to make a note in court.

WORKMEN'S LODGINGS IN PARIS.—The question of the supply of decent lodging at moderate rents for the working classes is even more pressing in Paris than in London. In consequence of the immense demolitions which have taken place, the workmen cannot possibly find what they require in many of the quarters of the town, and efforts are being made in all directions to provide for them in the outskirts. Three hundred houses are now being erected by order of the Empress at Montrouge with this view; they are all upon one uniform plan, and especially arranged for working men and their families.

PRIZE FOR MECHANICAL CULTIVATION.—A noteworthy effort is being made in the arrondissement of Compiègne, in France, to induce the application of the highest mechanical skill to the cultivation of the soil. A number of proprietors and farmers have subscribed to offer a grand prize of a hundred thousand francs (£4,000) to the inventor of a system of mechanical cultivation much more economical than those at present in operation.

DIRECT VACCINATION.—The Paris Academy of Medicine has reported favourably on the value of vaccination from animals, and on the expediency of an establishment for that object, and the Minister of Agriculture and Public Works has in consequence opened a credit of six thousand francs for the purpose of experiments in the system of vaccination direct from the animal.

French Architect at Hong-Kong.—The authorities of Hong-Kong having determined to erect a public building, to include a museum, a theatre, a public library, a chamber of commerce, a hall for concerts, balls, and public meetings, with all the necessary accessories, put the undertaking up for competition, and received plans from eight English and one French architect, and the prize of a thousand dollars has been awarded to M. Hermitte, the French architect charged by the Foreign mission with the erection of the Catholic Cathedral of Canton.

Magnesium Light.—It is said that the magnesium light has been applied successfully to the illumination of the theatre of Boston, in the United States of America. The wire is burnt in a large lamp, and is moved forward by means of clock-work; the consumption is said to be between half and three quarters of an ounce per hour.

MEETINGS FOR THE ENSUING WEEK.

Mon......Entomological, 7.
Royal Inst., 2. General Monthly Meeting.
Odontological, 8.
Farmers' Club, 5½. Discussion on "Agricultural Shows, and their influence on Agricultural Progress."
Society of Engineers, 7.

Tues... Pathological, 8.
Anthropological, 8.
Geologists' Assoc., 8.
R. Horticultural Soc., 3. Scientific Meeting.

Wed ...Society of Arts, 8. Mr. N. P. Burgh, "The Manufacture of Sugar, and the Machinery employed for Colonial and Home Purposes."
Microscopical, 8.
Pharmaceutical, 8.

Thur....Linnæan, 8. The Rev. M. J. Berkeley, "On a new British *Fungus*."
Chemical, 8.
Artists and Amateurs, 8.

Fri .....Philological, 8.
Archæological Inst., 4.

Patents.

From Commissioners of Patents' Journal, March 23rd.

Grants of Provisional Protection.

Air and gas, carburretting—498—E. J. C. Welch.
Animal charcoal, washing—683—J. Norman.
Bacon curing rooms, cooling—737—R. A. Boyd.
Boilers, rendering sea water suitable for use in—667—J. Gray.
Boiler tubes, expanding—699—G. T. Bousfield.
Bread—2973—J. C. Walker.
Chaff-cutting machines—639—E. W. Otway.
Chlorine gas, utilization of the residual liquor arising from the production of—753—W. F. Deane.
Coal, cutting—703—G. E. Donisthorpe.
Coca, preparing—189—W. E. Gedge.
Eyelets—687—G. T. Bousfield.
Fabrics, ironing and finishing—765—W. Clark.
Fibrous substances, preparing—588—F. M. Jennings.
Fire-arms—677—M. Henry.
Fire-arms, breech-loading—578—W. E. Newton.
Funnels—743—H. A. Bonneville.
Furnaces—757—J. B. Vuldy.
Grain, mills for grinding—695—E. and H. Roberts.
Hair pins—711—A. and J. Trotman and T. J. Cole.
Hat bodies, pressing and ironing—188—W. E. Newton.
Illusory exhibitions, apparatus used in—689—A. Stoddart.
Iron, melting—727—A. V. Newton.
Iron safes and strong rooms—685—J. Chubb.
Knitting machines—2983—S. Norris.
Liquids, evaporating and cooling—747—G. Severn.
Liquids, producing illuminating gas from—669—T. Clayton.
Liquids, registering the flow of—518—E. M. Du Boys.
Magnesium, obtaining light by the combustion of—729—R. Larkins.
Mangling, apparatus for—643—R. Walker.
Metals, casting—701—W. Atkinson.
Omnibuses, registering the number of passengers entering—586—T. Edwards, jun., and S. Iniff.
Optical instruments, reflecting—723—H. T. Humphreys.
Ordnance—673—W. E. Newton.
Ores, washing and separating—707—J. Hunt.
Oxy-hydro magnesian light—3248—T. Parker.
Peat as fuel—590—W. E. Gedge.
Pen and pencil holders—709—J. A. and A. Norman.
Petroleum, distilling—663—W. A. Vérel.
Potatoes, planting—633—E. Loomes.
Railway carriage brakes—651—W. E. Newton.
Railway trains, signalling on—679—R. Donaldson.
Raisins, removing the stones from—398—W. R. Lake.
Reaping hooks and sickles—755—G. Booth.
Rocks, perforating—655—J. Stevenson.
Safes—641—J. Tansley.
Safes—717—T. B. Moxon.
Sawing machinery—598—H. Wilson.
Screw keys or spanners—697—H. Chandler.
Screw rivets and screw nails—623—A. C. Andrews.
Ships' binnacle lamps—556—W. Nunn and C. W. Brown.
Shutters or blinds, revolving—767—E. W. Bunnett.
Soda from common salt, making—629—W. Weldon.
Soda from common salt, obtaining—627—W. Weldon.
Spades, &c.—761—J. W. Yates.
Spike—631—W. R. Lake.
Springs—763—J. F. Belleville.
Steam boilers, cleaning the tubes of—681—S. Soutar.
Steam boilers, safety-valves for—665—H. Hackett.
Steam boilers, superheaters for—661—J. Stocks.
Steam cultivators—657—J. Bischoff.
Steam ships, boilers and engines of—759—J. Elder.
Studs, &c.—735—W. E. Gedge.
Submarine telegraphs—222—F. Wibratte.
Substances, distilling—478—J. Young.
Textile fabrics—659—M. A. F. Mennons.
Vessels at sea, apparatus for conveying tidings of—693—G. Reade.
Vessels, cleaning the bottoms of—574—T. Bailey.
Vessels, indicating the quantities of liquids in—705—J. Tomlinson.
Vessels, side propellers for—721—E. Forster.
Vices—649—J. Spear.
Washing machine—713—W. H. Fletcher.
Watches and clocks, keys for—637—J. Carpenter.
Windows, sliding shutters for—745—J. H. Mullin.

Invention with Complete Specification Filed.

Straw hats and bonnets, pressing—775—M. Morse.

Patents Sealed.

2461. T. F. Cashin and J. F. Allender.	2501. W. Schofield and J. Smith.
2464. R. A. Brooman.	2505. J. Duke.
2471. J. Taylor.	2510. J. W. Hurst.
2473. L. H. Gillet.	2531. C. P. Button.
2476. W. Tatham.	2573. R. M. and D. Cameron.
2477. W. Morgans.	2593. J. Homan.
2478. R. A. Brooman.	2594. J. Homan.
2481. J. J. McComb.	2604. J. Sturgeon.
2487. J. Maublanc.	2685. W. Schofield.
2488. W. E. Metford.	2717. R. Biessy.
2491. E. T. Hughes.	2733. A. Parkes.
2499. E. Cottam.	2875. W. Manwaring.
	3163. A. Parkes.

From Commissioners of Patents' Journal, March 27th.

Patents Sealed.

2293. F. Tolhausen.	2590. T. Campbell.
2498. R. A. Brooman.	2592. J. B. Thompson.
2507. J. and G. Addenbrooke and P. A. Millward.	2601. W. Clark.
2511. J. E. Townshend.	2623. T. du Boulay.
2512. E. Lindner.	2678. G. Davies.
2514. R. Willacy.	2762. H. Wilde.
2515. J. H. Johnson.	2763. H. B. Barlow.
2518. S. Faulkner.	2796. W. E. Newton.
2519. W. Longbottom.	2817. A. V. Newton.
2532. W. R. Lake.	2960. W. Clark.
2533. C. Walker and W. Preston.	3079. I. M. Singer.
2551. M. Henry.	3090. I. M. Singer.
2569. G. W. Rendel.	3144. G. F. Russell.
2574. W. Clark.	3239. H. W. Miller.
	226. J. Howard & E. T. Bousfield.

Patents on which the Stamp Duty of £50 has been Paid.

745. J. Nield and T. A. Nield.	773. A., J., and J. Topham.
758. J. M. Hetherington.	785. R. A. Brooman.
994. W. E. Newton.	786. G. T. Key.
749. G. Coles, J. A. Jaques, and J. A. Fanshawe.	803. R. A. Brooman.
769. J. Reilly and W. Martin.	819. H. Hughes.
764. W. Johnston.	830. R. A. Brooman.
765. T. G. Grant.	942. J. Smith.

Patents on which the Stamp Duty of £100 has been Paid.

797. W. Haggett.	768. M. A. Muir & J. Mellwham.
778. T. Carr.	846. E. Morewood.
744. J. H. Johnson.	924. W. A. Martin and J. Purdie.
746. F. Tillett.	810. F. Morton.

Journal of the Society of Arts.

FRIDAY, APRIL 6, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'Clock :—

April 11.—"On the Piracy of Trade Marks." By E. H. Underdown, Esq., Barrister-at-Law.

April 18.—"On the Diseases of Meat as affecting the Health of the People." By Dr. Thudichum.

Cantor Lectures.

The following is the syllabus of a course of four lectures "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," to be delivered by Dr. F. Crace Calvert, F.R.S., as follows :—

Lecture I.—Friday, April 13th.

"On the Synthesis of Organic Substances."

The direct formation of *acetylene* (the most illuminating compound of coal gas), of *formic acid* (the acid of ants), and *alcohol* (spirits of wine) from mineral compounds. The transformation of *acetylene* into *olefiant* gas, of *formic* into *marsh gas* (fire-damp), of *alcohol* into *acetic* acid, and of these substances again into *benzol*, *phenol*, and *aniline* (products obtained from coal tar), and of *marsh gas* into *acetylene* and *benzol*, &c., &c., &c.

Lecture II.—Friday, April 20th.

"On the Transformation of Neutral Substances."

On the transformation of *starch* into *cane* and *grape sugar*, and also *pectic acid* (with remarks on the ripening of fruits and the production of jellies). On the transformation of *sugar* into *alcohol*, *ether*, *aldehyde*, *acetic*, *formic*, *prussic*, *oxalic*, and *butyric acids* (the acid of rancid butter), and also the conversion of *sugar* into *mannite* (obtained also from manna), and into *lactic acid* (acid existing in the blood and flesh of animals, and also in sour milk).

Lecture III.—Friday, April 27th.

"On the Transformation of Organic Acids and Animal Substances."

The artificial production of *benzoic acid* (found in benzoin resin) from the essence of *bitter almonds* and from *coal tar* products, and its conversion into *hippuric acid* (found in the secretion of herbivorous animals); of *tartaric acid* (the acid characterising cream of tartar), from *sugar of milk* and from *succinic acid* (the acid obtainable from amber), and its decomposition into *oxalic* and *acetic* acids—On the transformation of *citric acid* (the acid of lemons and oranges) into *aconitic acid* (found in wolfsbane)—On the transformation of *malic acid* (which characterises the acid flavour of green gooseberries, apples, and rhubarb) into *fumaric acid* (the acid of common fumitory) and also into *equisetic acid* (the acid found in the marsh horsetail), and, lastly, into *asparagine* (the body found in asparagus and potatoes)—The transformation of *uric*, *cyanuric*, and *cyanic* acids into *allantoin* (the substance found in the allantoid fluid of cows)—On the artificial production of *urea* (a substance which characterises the liquid secretions of man and of many other animals).

Lecture IV.—Friday, May 4th.

"On the Artificial Production of Aromatic Substances."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadow-sweet*, *coumarin*, and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor*; of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

The lectures will commence at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture. For this purpose a set of tickets is forwarded with this number of the *Journal*.

Art Workmanship Prizes for 1866-7.

The Council have decided to enlarge the basis on which artisans may compete for prizes for Art Workmanship, and have passed the following resolutions :—

Any producer will be at liberty to exhibit, either in his own name, or through his workmen, any work or works as specimens of good workmanship in the classes given below, provided that the work or works be accompanied with a statement of the name or names of the artisans who have executed their respective portions; and if the work or works be sufficiently meritorious to deserve them, extra prizes will be given to the artisans who have executed them.

Artisans may, if they think fit, exhibit works executed by them after other designs, in any of the above-mentioned classes. Such works may contain the whole or portions of the prescribed designs, and must be of a similar style and character. Competitors must specify the class in which they exhibit. Extra prizes will be awarded.

The works submitted must be delivered at the Society's House on or before the 22nd December, and will be exhibited at the Society's house, and afterwards at the South Kensington Museum. A selection of the best works will be made and sent to the Paris Exhibition of 1867.

The Classes will be as follows :—

FIRST DIVISION.

Works to be Executed from Prescribed Designs.

Class 1.—Carving in Marble, Stone, or Wood.
Class 2.—Repoussé Work in any Metal.
Class 3.—Hammered Work, in Iron, Brass, or Copper.
Class 4.—Carving in Ivory.
Class 5.—Chasing in Bronze.
Class 6.—Etching and Engraving on Metal—Niello Work.
Class 7.—Enamel Painting on Copper or Gold.
Class 8.—Painting on Porcelain.
Class 9.—Decorative Painting.
Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.
Class 11.—Cameo Cutting.
Class 12.—Engraving on Glass.
Class 13.—Wall Mosaics.
Class 14.—Gem Engraving.
Class 15.—Die Sinking.
Class 16.—Glass Blowing.
Class 17.—Bookbinding and Leather Work.
Class 18.—Embroidery.
Class 19.—Illuminating.

SECOND DIVISION.

Works to be Executed without Prescribed Designs.

Class 20.—Modelling.
Class 21.—Wood Carving.

Except in Classes 1, 2, and 4, the subjects will remain as in the list already issued; but in Classes 1, 2, and 4, other subjects will be given, particulars of which will be duly announced.

Institutions.

The following Institution has been received into Union since the last announcement:—

Burrage-road Evening Classes, Plumstead-common, S.E.

Proceedings of the Society.

Seventeenth Ordinary Meeting.

Wednesday, April 4th, 1866; William Walker, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Armstrong, Richard Baynes, King-street, Lancaster.
Ashbury, James, 27, Great George-street, S.W.
Austin, Stephen, Hertford.
Birley, Samuel, Ashford, Derbyshire.
Bryant, Wilberforce, Patent Safety Match Works, Fairfield, Bow, E.
Dutton, Francis S., F.R.G.S., Reform Club.
Fowler, Francis H., 32, Fleet-street, E.C.
Gossage, William, Widnes Soapery, near Warrington.
Gowland, G., 76, South Castle-street, Liverpool.
Holdsworth, Samuel, 54, Spencer-st., Clerkenwell, E.C.
Mander, Charles Benjamin, Varnish Works, Wolverhampton.
Middlemore, William, Holloway Head, Birmingham.
Patterson, W., jun., 2, Dover-place, Clifton, Bristol.
Penson, Richard Kyrke, Ferryside, Kidwelly.
Rowden, William T., Burrage-road Evening Classes, Plumstead, S.E.
Rüst, R. A., 8, Argyll-street, Regent-street, W.
Watkins, Charles A., 10, Greek-street, Soho, W.
Wood, J. W., Custom House, Harwich.

The following candidates were balloted for, and duly elected members of the Society:—

Baker, Rev. Charles, M.A., Tellisford, Somersetshire.
Chubb, Harry, 33, John-street, Bedford-row, W.C.
Hunt, John Hammond, 20, Cannon-street West, E.C.
Loy, William T., Dingwall-road, Croydon, S.
Myers, William Henry, 302, Whitechapel-road, E.
Webb, John Stephen, 34, Cadogan-place, S.W.
Whitelaw, John, Dunfermline.

The Paper read was—

THE MANUFACTURE OF SUGAR, AND THE MACHINERY EMPLOYED FOR COLONIAL AND HOME PURPOSES.

By N. P. Burgh, Esq.

The importance of sugar cannot be overrated, when we consider the enormous increase of this dietetic article all over the world. In the United Kingdom alone, the consumption is now close upon half a million tons yearly, or over 42 lbs. per head to the population, whilst in America India, Australia, and other countries, the consumption is nearly as large and yearly increasing. Mr. P. L. Simmonds, in his new edition of Waterston's *Cyclopedia of Commerce*, published in 1863, states, that the consumption of sugar
in the world might be roughly estimated at 2¼ mi
tons, of which the United Kingdom uses 462,500 tons
rest of Europe about as much, and the United States n
400,000 tons. The production of cane sugar is pe
only about 1½ million tons; but maple sugar 40,000
date sugar, 100,000 tons, beet-root sugar, 500,000
and potato sugar make up the deficiency. The follo
estimate of the production of cane sugar, in 18
given by Mr. Simmonds, and it is probably app
mately near the mark at the present time, as re
the total; for while there has been an increase in
duction, in many quarters, to the extent of 25 per
in the United States and some other countries
has been a falling off.

Production of cane sugar in 1860:—

	Tons.
Brazil	100,000
United States	114,000
Cuba	300,000
Porto Rico	50,000
French West Indies	65,000
Danish West Indies	7,500
Dutch West Indies	15,000
British West Indies	200,000
East Indies, Siam, China, &c.	300,000
Mauritius	122,000
Java	100,000
Manilla	25,000
Natal	4,000
Bourbon, Central America, Peru, Sandwich Isles, and others	10,000
Total	1,412,500

We have no data to fall back upon of the number
sugar works in all the producing countries (and
would be useless to furnish the data for a few), no
the character of the machinery and plant used;
the extent of the production shown in the figures q
will convey an idea of the great interests at stake,
the large capital that must be embarked. Less per
is known generally by the public, and even
specially interested, of sugar machinery than of
other description of machinery in use.

It would seem hitherto to have been the policy
makers to surround their workshops with mystery,
to publish nothing whatever in the shape of info
tion. In the several International Exhibitions,
machinery has always been very poorly represented,
planters, merchants, and refiners have had few oppo
nities of inspecting improvements. In the Jury Rep
on Food, at the last London Exhibition (1862), it
observed that the production of sugar was more lar
illustrated than it was in 1851, but there had been
little marked improvement in its manufacture du
the eleven years which had elapsed since the for
Exhibition, notwithstanding that the use of the tur
or centrifugal process, whereby the molasses is
quickly separated from the crystallizable sugar, had b
much introduced; and it was added with regret that
little if any information had been given from any of
different countries, on the subject of sugar manufact
Without attending to the simple processes of obtai
maple sugar in North America, to the manufacture
sugar from the Sorghum as carried on in the United St
to the production of date sugar in India, or the
extensive manufacture of sugar from beetroot on
Continent, I shall restrict myself to noticing the ma
nery in use for extracting sugar from the juice of
cane, and for subsequently refining the raw sugar.
need not at all allude to the cultivation, for this has b
frequently treated of; chemical investigation has
been brought to bear with great advantage in the se
processes of manufacture; and I may direct attention
the important published treatises, "Researches on
Juice of the Sugar Cane and the Modifications it un
goes during Manufacture," by Dr. Icery, President
the Chamber of Agriculture, Mauritius, a translation

which is now in course of publication in Mr. Simmonds' Journal the *Technologist*, and the valuable chemical researches contained in the essay on the "Cultivation of the Sugar Cane in Cuba," by Don Alvaro Reynoso, published at Madrid, by the Spanish Government, last year.

The amount of sugar machinery exhibited in the International Exhibitions of 1851 and 1862 consisted simply of mills, open evaporating pans, vacuum pans, and centrifugal machines, being, in fact, an illustration of the shadow of the reality required. The improvements made in sugar machinery have been but poorly represented at all times. This may perhaps be partially attributed to the want of public interest in the matter. Engineers also seemed afraid to instruct each other. In fact, when I published my "Treatise on Sugar Machinery," in 1863, many of my friends predicted my total annihilation by those in power. On the contrary, however, the work in question has not deteriorated my position, but rather improved it. I was not, however, the first in the field, for in 1850 Mr. J. A. Leon gained the prize gold medal offered, through this Society, by H.R.H. the Prince Consort, who has ever promoted the advance of science and art. The prize essay was—"The Art of Manufacturing and Refining Sugar." Later than this, in the Society's *Journal* for October 13, 1865 (p. 717), an allusion is made by Dr. Calvert to a new process of preserving the cane juice by congelation, termed "concreting." This is the invention of Mr. A. Fryer, of the firm of Fryer, Benson, and Foster, of Manchester. From communication with those gentlemen, I am led to believe a great desideratum has been gained, viz., a dry goods for transit without waste. This will be better appreciated when it is known that in one voyage from the colonies the amount of drainage per hogshead is, for raw sugar, 10 lbs., and for refined, 2 lbs. to 3 lbs. I am told, also, by credited authorities, this drainage is too often deemed useless.

I now propose to bring under notice the colonial and home manufacture of sugar, together with the machinery employed.

Colonial Manufacture.

With reference to the manufacture or the production of sugar from the cane, the commencement of the process in some colonies is a formal ceremony. Mr. Reed, in his late work "On Sugar," informs us that "there is much bustle in the sugar-house when crop time arrives; it wears a very animated appearance. The whole concern is overhauled; water is being drawn and stored for constant use in grinding time, cleanliness being the very keystone of success in colonial sugar operations. Engine and mill are being taken to pieces and carefully examined; kettles are cleansed; walls are whitewashed, and the molasses tanks cleansed from thousands of dead rats and cockroaches. At length, all having been arranged, the engineer informs the overseer, or 'mayoral' as he is called, that grinding may commence. This announcement is made with all solemnity; and a solemn one it is, for the operation of grinding having once commenced, it must not be intermitted. The mayoral has some time ago examined all the cane patches, and arranged in his own mind the order in which they shall be cut. A day is appointed for beginning work, and before it comes the season is one of amusement. The negroes sleep, dance, or beat the gumbo, as may seem to each best. The whites probably gamble, or pass the time at the *baile* or ball. The morning of operations at length comes. With daybreak the mayoral tells off the gangs, each slave armed with a machéte, or cane knife. A string of bullock carts follows the gangs to the fields, to bring the cane to the mill immediately when cut. A negro mayoral, or overseer, heads each gang; he is armed with a machéte more ornamental than those of the rest, and, moreover, carries a stout whip, the better to enforce his authority." Each gang proceeds to its allotted portion, for the purpose of separating the cane from the stalk. The cutting is close to the surface of the ground, as the lower portion of the cane contains the greatest amount of saccharine. Each cane is singly handled, both for cutting and trimming, and divided into lengths of about two to three feet. The trimmed portions are gathered indiscriminately, in some cases, into the wains and carts, and thus transmitted to the receiving shed near the mill-house. The next stage of the process is "crushing the cane." Many schemes have been tried to supersede the general mode, which is by rollers.

In 1853, a patent was taken out for "cutting the cane into short lengths, and then reducing it to sawdust;" after which the cane is subjected to the action of steam, preparatory to compression—this latter attained by hydrostatic pressure. Other processes have been invented, such as to cut the cane into slices, soak them in water of a given temperature, and complete by evaporation. A third idea has been to slice the cane and dry it, for the purpose of transit; after which the soaking and evaporating processes are carried out. From my own experience, and from information imparted by sugar planters, I feel no hesitation in stating the rolling or crushing process to be the most practicable yet brought into operation.

The cane is now presumed to be in the shed before alluded to; each portion is laid on the carrier or feed table of the mill, not at random, but in rows longitudinally, or at right angles with the roll's length. The mill generally adopted is the three-roll kind, to which I shall directly advert. The top and inside rolls grip the cane, and thus the parts in contact become propelling and crushing at the same time. The outside and top rolls grip the partially crushed cane, and thus complete the process. The term given to the crushed cane stalk, in colonial language, is either "bagass or megass," but the latter is mostly used in England. The megass presents itself in flat portions of about three to four feet in length, principally used by the planter as fuel. This is much to be wondered at, when it is remembered that the ground producing the cane is actually thus robbed. The cane should be returned to the soil, as the natural manure, instead of having recourse to artificial and expensive kinds. The planter may urge, in answer to this, that wood is scarce, and coal inaccessible; and he has thus to choose between two evils, "either to purchase manure or fuel," and he generally prefers the former. I have not the least doubt, however, that in proportion to the better means of colonial transit, megass will in future be correctly applied. Its money value as a manure, in proportion to coal for fuel, may be said to be about equal. There are, however, divided opinions on this subject, but I think it will be found that the most competent authorities will be unanimous on one point, that megass is adapted for manure more naturally than for fuel artificially.

I may state that the furnaces required for megass are larger than when adapted for coal; and for this reason the ordinary egg-end boiler is often used, the fire-place being outside the shell, instead of within the same, as with the Cornish or internal type. In my own practice I use a long-flued boiler, in preference to the egg-end or tubular kind, having found it to be more simple to manage than the latter, and more effective for evaporation than the former.

Having thus disposed of the cane, attention may now be given to the extract from the same. The liquor or juice is received into the bed-plate, and from thence runs into a tank located at the side or end of the mill, usually the latter. The colonial term given to the cane juice is "ching." The ching, after leaving the bed-plate, should be pumped into the boiling utensils. These vessels are heated by steam or fire. In some colonies the latter is still advocated, while in others science has been recognized and steam introduced. The primitive mode of evaporation is by a series of concave boilers, each less in depth than the preceding one. This arrangement is termed the "train." In other examples longitudinal

vessels are used, secured end to end, flues extending underneath for the entire length; this arrangement is termed a "batterie." The disadvantages of open pans are that the atmosphere injures the liquor, while at the same time the increased temperature carbonizes the sugar, and produces molasses, &c. Since engineers have turned their attention to sugar machinery great improvements have been made. Heating by fire is always uncertain; the temperature may be raised too high, without any immediate check.

The native boilers, as a rule, are not famed for their high conception of their duties; they rather work at hazard than by understanding, and fall into some amusing as well as disastrous mistakes. Many anecdotes can be related proving the truth of these remarks. In an excellent periodical, the *Colonial Magazine*, for January, 1849, edited by Mr. Simmonds, there is an article "On the Establishment of Central Sugar Works in the British Sugar Colonies," by Mr. John Biggs, Colonial civil engineer. He states:—

"In 1844, when in Antigua, to see if the negro boiler was observant of the changes in cane-juice, as well as to ascertain what idea he had of it, I called the attention of the head boiler to the fact that the two first skips of sugar in the morning contained a much larger quantity of molasses than the skips boiled later in the day, to see how he would account for it. He said:—'Cause of too much molasses in the sugar is liquor too long on the fire; him stew from sundown to sun up—this make molasses. Sugar boil late in the day, with good fire, him no have time to make much molasses.' Poor fellow! he had no idea the juice was forming that subtle and formidable enemy to crystallization, or that if he had continued slow boiling for a few hours, and added a few pounds of *tous les mois*, as the ladies do isinglass to set the material, he would have made his master a hogshead of jelly of some kind of fruit, the particular description cannot be stated, as it rather partakes of a species of lottery. However, this shows the necessity of continuous work in the manufacture of sugar, as every interruption to the process causes a serious loss, by the conversion of a very large portion of the crystallisable part of the syrup into molasses; it is this continuous work, even on the largest and best conducted estates, which it is impossible for the sugar planter to effect, nor can it ever be accomplished but by the aid of central works, where power and capital will effect this desirable object."

Mr. Reed (already alluded to) gives a lucid account of the primitive mode of evaporation, and the arrangement of the train, defecators, and clarifiers. He says:—

"The series of open pans in which the evaporation is conducted, taken collectively, is called 'the train,' the setting of which is subject to variation, though the most general arrangement is as follows: beginning with the flue, which is straight, and from forty to fifty feet long, one extremity of it ends in the great chimney, the other communicates with the furnace grate and ash-pit. The flue runs along one of the side walls of the sugar-house, the mouth of the furnace being outside. The arrangement of the flue is such that the pans when set rise about two feet above the level of the floor. The arrangement of the pans is linear, corresponding with the flue, all except the two defecators which stand side by side. In order to heat these, the flue before reaching them is split into three channels, one passing between the two defecators, one on each external side. Dampers are so arranged, that the fire may be turned aside from either flue at pleasure, on the instant; this being necessary, inasmuch as when a crust of vegetable impurity has formed, any prolongation of heat would break it up, and thus prevent its removal by skimming. On the proper setting and efficient management of the defecators depends the success of future operations.

"Next come the clarifiers, two iron pans set in brickwork. The second clarifier is a little smaller than the first, to allow for shrinkage of juice by evaporation. After the clarifiers come the evaporators, the first of which is set deep in brickwork, and its size is increased by an upper flange, thus giving room for the copious scum thrown up as the operation progresses. Lastly, and directly over the furnace, where, consequently, the heat is greatest, comes the "*tache*" or teache, arranged exactly like the preceding vessel, but somewhat smaller.

"This description having been given, let us now assume the train at work. Communicating with the juice-tank is a moveable gutter, which, being directed to each pan in succession, charges them with juice. The fire is now lighted, and the train is said to be started. So soon as the juice has warmed up a little, a portion of cream of lime is added, cream of lime being a suspension of lime in water, hence it is stronger than lime-water, which is an actual solution of lime. This cream of lime, called "*temper*," is added according to the sugar master's judgment. He is now, in Cuba, usually guided by the evidence of reddened litmus paper, just as a laboratory chemist would be guided. The object in adding lime is not merely to neutralize vegetable acid, a purpose for which carbonate of lime would be as effectual, and would at the same time be unattended with the danger to which the operator exposes his saccharine juice if he adds a large excess of lime. The special effect which lime has in this operation, as compared with carbonate of lime or chalk, is that of coagulating the vegetable albumen present in cane-juice; bringing it to the surface, whence it is removed in the condition of scum. As the heat rises this scum increases, and negroes standing by remove it with a skimmer. The pan nearest the furnace of course boils first, but ebullition soon commences all along the train. As the juice diminishes in the teache, or striking pan, it is supplied by ladling from the next vessel, or evaporator. This, in turn, receives juice from the second clarifier, to which the first clarifier ministers, this being supplied from the defecator. In this manner the train is started; but, inasmuch as the pans were all empty at the beginning, the juice has had no regular defecation; the first strike, therefore does not commonly turn out well. Neither of the defecators has yet come into play, but one of them is now filled from the receiver. Whilst filling the sugar master tests the juice with litmus paper. This paper is blue, and the blueness changes to red more or less pronounced on coming into contact with any acid. Sugar-cane juice is always acid more or less, and it would be desirable if possible to neutralize the acid absolutely. The Cuba sugar master never attempts this; he knowing from experience that a slight excess of acid is preferable to an equivalent excess of lime. He adds cream of lime, therefore, not until the paper reddened by cane-juice changes back to blue again, but until the redness fades back to a faint rose colour. Juice being treated up to this point only requires heat and rest to bring the albumen and many other impurities up to the surface. The defecators are so arranged, that after the train is once started one is always full and the other empty: the latter being cleaned out.

"A train being once started, it goes on night and day, with the occasional rest of a day now and then to wash up, clear out the juice tanks and gutters, and effect such repairs as may be necessary. During these intermissions the negroes have a holiday, which they usually devote to sleep.

"A few old hands are usually attached to every Cuban sugar estate, who know as much about boiling as any sugar master—a great deal more, perhaps, than a newly-appointed sugar master, a stranger to some particular battery. The diplomacy that then takes place between Sambo and the master is edifying. Some old negro, who may have worked on the estate for twenty years, and who knows all about this particular battery, goes to the teache, when—taking a little of the syrup between his finger and thumb—he draws it out in a thread, and infers from the appearance of the latter that the juice has been boiled enough. Meanwhile the sugar master is away, though accessible, smoking his cigarette. Sambo tells him the skip is ready; but it would never do for the

sugar master to seem to be taught by Sambo. He knows that a few moments will make no practical difference, so he pulls out his watch, and affects to look with much edifying mystery at the dial. At length he lets Sancho, or Pedro, adjust the gutters leading from the teache to the cooler ten feet away, and the skip of emptying of the teache is effected."

The present mode of evaporation is by steam clarifiers. There are generally three to each mill. The ching is pumped into a tank, located above the clarifiers; in other cases direct into the latter. The operation of boiling or heating is this: Presume the ching in the clarifiers; steam is turned on, which circulates through the worm and surrounds the bottom, the latter being encircled by a jacket. When the temperature has reached to 130° to 140°, milk of lime is added in the proportion of about two or three ounces to 100 gallons of ching, which is gently stirred to mix the compounds; it may be added that the use of the lime especially is to prevent fermentation. The temperature is now presumed to reach nearly boiling point, or 205°. The scum on the surface will now break and disclose a white froth underneath. The increase of temperature can be suddenly checked by closing the supply steam-valve, and the liquor remaining dormant for 10 or 15 minutes, is ready for drawing off. It will thus be seen the advantages, of regulating the required temperature and the absence of striking teaches and manipulation.

Instead of continuing the evaporation, the better process is to filter the liquor—as it is now termed. This is attained by a series of bags located in a casing directly underneath the clarifiers. The syrup enters these bags of a dark hue, and comes out considerably lightened in colour, leaving behind many impurities, not to be eradicated by evaporation alone. After filtering the syrup flows direct into a tank, having within it a steam worm to preserve the temperature, it being remembered that the grain of the sugar is not yet formed. Now this tank can either be used as an open boiler or evaporator, or merely as a receptacle between the bag filter and the boiling pan. The syrup has now to undergo a second stage of evaporation. Here science is too often pushed aside, and planters will adhere to open pans; although engineers point out the advantages of evaporation in vacuo, the planter still fancies the old process. It must be remembered that to granulate or produce the crystals in sugar, a low temperature is imperative. If the syrup is congealed by high temperature, it carbonises, and becomes discoloured, and what should be sugar is molasses, actually what is not in the cane naturally. The process of evaporation by the open pan is simply a matter of slowly reducing the quantity of syrup, or retaining the denser portion, by a given temperature. Now when boiling in vacuo, science lends its aid, and less time is occupied, with a certainty of producing the required density. The time occupied for boiling depends on the nature and quantity of the syrup, hence no rule can be given. Assume a final proof to be taken, and the sugar to be sufficiently granulated, the discharge valve is opened, and air admitted into the vacuum pan which accelerates the exit of the syrup.

The remainder of the process depends on the class of sugar to be sent into the market. Should "raw sugar" be required the liquid is further extracted by atmospheric means. These are of two kinds, and though widely different in construction, are alike in theory. The primitive mode is on the pneumatic principle. A tank-shaped vessel is fitted with a false bottom, perforated with minute holes, the actual bottom being of the ordinary kind. Now it is obvious that on exhausting the air between the two bottoms the atmosphere will act on the syrup, and the liquid portion be forced through the holes alluded to. The more simple and recent mode is by the centrifugal machine. This is simply a basket of wire and gauze-work, surrounded by a casing. The syrup is put into the basket, and a rotatory motion being given to the same, at a great velocity, say 800 to 1,000 revolutions per minute, the liquid in the syrup will be forced—by the atmosphere—through the basket into the casing. It will thus be understood that atmospheric means are employed in each case; the first is attained by the air pump, while the latter is produced by the vacuum caused from centrifugal force. The sugar, after being thus produced, is packed into bags or casks, and exported to the respective markets.

In the event of a more refined, or rather a purer, article being required, the filtering and granulating processes are again proceeded with. Now in this case bag filters are not available, for two reasons; first the texture of the material forming the bag can do no more than retain impurities, as before alluded to; secondly, the absorption of the colour is now requisite. To attain this desideratum animal charcoal has been introduced; hence to filter after the first granulation, charcoal filters are imperative. I may here add that the reason for filtering before granulation, is simply to reduce the colour as much as the impurities, it being known that the boiling or granulating process heightens the colour rather than reduces its hue.

The filters now alluded to are cylindrical vessels, fitted with perforated false bottoms, covered with flannel, to prevent choking. These cisterns are partially filled with animal charcoal, from eighteen inches to two feet from the top. The syrup passes direct through the charcoal, and by that simple mode is cleansed. The difference in the colour of the sugar before and after passing through the charcoal may be taken as brown brandy compared with the palest sherry.

The process of granulation is again requisite. Tanks are provided for the reception of the purified syrup, and from these the evaporating pans are supplied. At this stage of the process the planter, as before stated, is often inexorable as to the use of the vacuum pan, in place of the open kind. It must be said in justice, however, that the main cause is perhaps the increased outlay at the commencement; but in the face of this, a better article can be produced, and thus its value increased. Another argument, urged in favour of the open pan, is its simplicity of construction and management; and its non-liability for repair. The vacuum pan, on the other hand, is said to be complicated, requiring skilful attention, extra appendages, in the shape of air pumps, condenser, &c. The planter also pleads that he cannot always find skilled mechanics; hence the adoption of simple machinery producing an inferior quality of sugar is often preferred to a plant constructed on scientific principles, making a good article. The answer to these objections is a simple one,—perfect machinery and skilled attendants produce the best income in all cases of manufacture, and sugar in particular. We have full evidence of this in all examples of mechanical productions, as well as other classes of trade. The better article will produce the price in the market equivalent to its stage of perfection.

Assuming the sugar to have been granulated, it is next dried by the centrifugal machine, and then termed "refined sugar," not in the highest degree, but enough for general purposes, the next grade being "loaf sugar."

It may now be wondered at why the planter, having proceeded thus far in the production, does not complete the process—the answer, as a rule, will be much as before, adding, perhaps, the necessity of a quick return. True, in some instances, I know loaf sugar is produced in the colonies, but not often on the plantations, unless in a crude state.

I may, perhaps, be considered to advocate the abolition of "home refining;" such is not the case; I rather urge the planter—for his own benefit—what he does do, to do well, not in such an unfinished state as is now too often the case. I am aware, also, that there is not, in many colonies, good means of transit for machinery and material—hence, in some instances, the cause of the imperfect quality of the sugar.

Should the planter be in a position to produce loaf

sugar, the continued process will be thus:—Instead of drying the sugar, it is from the vacuum or open evaporating pan, let into the heater, a vessel semi-elliptical in elevation, and circular in plan. This pan is heated by steam, introduced within a casing or "jacket," the temperature of the sugar being thus increased or retained as requisite. The liquid, or rather semi-liquid sugar is now poured into moulds, these being either of a brick-like shape or cylindrical, the latter of unequal diameter at the extremities. The sugar is now by no means white, it is of a brown hue, and the removal of this colour, after setting, is the next stage. This is attained by drainage. After the sugar is congealed, and is in an almost solid state, a mixture of pure sugar and water is poured into the mould, and, by gravitation, sinks gradually through the loaf; the impurities which impart the colour, being dense, are effectually driven before the liquid alluded to. The primitive mode of purification was attained by "claying." Mr. Reed gives a truthful illustration of this:—

"To practice claying, it is necessary that the concentrated juice be at once turned into cones of metal or earthenware. Each cone is put upon its apex, which is hollow, the aperture being stopped either with a piece of wood purposely prepared, or, as is often done, a joint of cane. Sugár to be clayed is boiled a little stiffer than if intended for the cooler. Occasionally the concentrated juice, instead of being put into the cones at once, is turned into a wooden box running upon wheels, rather deep and long, in which it is agitated with a short oar for some time, until it has somewhat cooled, and crystals have begun to form; the box being then wheeled up close to the moulds, the latter are filled. In Cuba each mould contains from eighty to one hundred and twenty pounds of hot sugar. Crystallization is allowed to proceed in the moulds until the sugar-master considers the operation perfect. He then removes the plugs, when the molasses begins to drain away. The process of claying then commences. Clay being mixed into a sort of mortar with water is turned upon the base of each cone. The clay remains, but the water percolates through, carrying down many of the coloured impurities."

After sufficient time has elapsed for drainage each loaf is dried, either in the sun or in stoves suitably arranged, but mostly the latter. The sugar planter, by this additional process, can send "loaf sugar" into the market in such a state as he deems fit.

Sugar Refining House.

The process of refining the imported sugar will now be alluded to. The district ports mostly favoured in Great Britain are London, Bristol, Glasgow, and Greenock, the former and the latter being the principal. The class of sugar usually sent from the colonies is the raw or foot sugar. This is of a dark brown colour, interspersed with congealed molasses. Now, the art of the refiner is to supply to the market at home clean brown, moist, white moist, crystallised moist, and pure loaf sugar. The stages of the process in the three former examples of production are much alike, that for the last being an extension of the others. The sugar is imported in a crude state, being, in fact, congealed as quickly as possible for export, independently of the effect. Thus we have to pay, for our table-prepared sugar, the cost of two stages of manufacture; the first hasty and careless, and the second demanding care and attention from the result of the former. It has often been understood that raw sugar is actually sweeter than refined sugar, and that for culinary purposes the former is preferred. The fact actually resolves itself into this, that the presumed intensity of sweetness is not due to the impurity of the sugar, but rather to the quality of the same. Now, to describe the processes must be my next endeavour, commencing with that for producing "moist sugar."

Any one who has been at the east end of our metropolis must have noticed the tall buildings there located, seven to nine stories high, having windows to each floor. The general observer may naturally ask why are they so high? I will now explain. The less the sugar—when in a melted state—is agitated by compression, such as pumping or forcing, the better; hence gravitation, or a natural flow, is always preferred.

The sugar is exported from the colonies in casks, boxes, and bags, according to the custom of the exporter. On arriving at the sugar houses it is hoisted, by steam or manual power, to the "top floor," usually known by that name. This floor contains the sugar in its raw state, and the cases, bags, or casks are here cleansed, by steaming. Compartments termed "bins," are formed to hold the sugar until required further. On the second floor down are the blow-up pans, hence this room is often designated the "charging or blow-up room." Here the sugar is mixed with a syrup, composed of sugar and water, and steam is introduced to finally melt the whole. It may be added that each utensil will be fully described hereafter. The next or third floor is designated "the bag filter room." In this story the sugar, in a melted state, passes through bags, and leaves a certain amount of the impurities behind, termed "scum." The fourth floor is termed the cistern and warehouse room; here are stored the goods ready for the market, and cisterns or vessels to receive the melted sugar from the bag filters located above. The fifth story contains the animal charcoal cisterns, and the vacuum pan; this floor is generally known as the "pan room."

The sixth room is for the reception of the receiving cistern, containing the syrup after it has passed through the charcoal above. This room is also used as a warehouse, being generally on a level with the street or pavement. In this floor are the coolers to receive the melted sugar from the vacuum pan.

The basement is termed the "fill and machine room." Here the sugar from the coolers is dried in the centrifugal machines, afterwards put into hogsheads, and warehoused till sent into the market.

The next process which I shall allude to will be that for producing "loaf sugar." I must now state that the difference in this case from that just described commences in the sixth room. Here, as just alluded to, are the cisterns, but in the place of "coolers," "heaters" are required. In the former case, the density of the sugar from the pan was hastened, while in the latter, or the one in question, the temperature must be preserved, and, in some instances, increased, to produce the desired effect. When the granulation is attained in the vacuum pan, it is let into the heaters, and therein stirred, to effectually mix the grain. The sugar is now put into moulds of four kinds, the technicalities of which are bastards, lumps, tittlers, and loaves. The first weigh 56 lbs.; the second, 43 to 46 lbs.; the third, 20 to 35 lbs.; and the fourth, 3 to 18 lbs. I may here state that the loaves are becoming almost extinct in London. It will not be out of place to give the dimensions of the several moulds alluded to:—

a = the top diameter.
b = the bottom ditto.
c = the length.

Bastard = 56 lbs. in weight.
a = $14\frac{3}{4}$ inches.
b = $7\frac{1}{4}$ inches.
c = $24\frac{3}{4}$ having an addition at the small end in the form of a cone 5 inches in length.

Lump = 44 lbs.
a = 12 inches.
b = $6\frac{1}{2}$ inches.
c = $24\frac{1}{4}$ inches.
Additional length, $5\frac{3}{8}$ inches.

Tittler = 28 lbs.
a = $9\frac{5}{8}$ inches.
b = 4 inches.
c = 22 inches.
Additional length, $3\frac{3}{8}$ inches.

Loaf = 10 lbs.
$a = 6\frac{1}{4}$ inches.
$b = 2\frac{1}{4}$ inches.
$c = 17\frac{5}{8}$.
Additional length, $3\frac{1}{2}$ inches.

The actual proportion can thus be readily understood.

To proceed with the description; the sugar is now presumed to be in the heater; while in a semi-liquid state it is put into the moulds, either by ladles or by troughs, but unfortunately more often the former. The drainage is now the next operation; the time occupied greatly depends on the moulds and the nature of the sugar. Bastards are the refuse of the whole, and consequently, being of a greater density, occupy more time in drainage. The following is the actual result in a London sugar refinery. Bastards, 14 days to three weeks; lumps, 6 to 8 days; tittlers, 4 to 6 days; and loaves, 3 to 5 days. The moulds are lifted by machinery from the filling-room to the drain rooms. Above the pan-room the bastard and lumps are located. The next floor contains the tittlers, the room above being for the loaves. In order to attain that pure whiteness so well known in loaf sugar, "magney" is required. This is a technical term given to a compound of the finest sugar and water, thoroughly mixed. A tank is provided for its reception, and each mould is supplied by a gutta percha tube, the quantity being regulated by a stop-cock. The sugar is now allowed to drain to the required state. The next process is to remove the sugar from the mould; this is attained by knocking the latter at the small end. The loaf is then trimmed with a knife at each end, to remove the coloured portions. In some instances mechanical means are used, termed shaping and nozing machines, the former being for the flat and the latter for the conical end. After the sugar is properly trimmed, each loaf, tittler, or lump, as the case may be, is wrapped in the well-known blue paper, and put into the drying stove. This is a room having racks on each side, spaced or pitched from two to three feet. At the bottom is a service of steam pipes, which heats the stove to a temperature of 130° to 145°. Each loaf is laid on its side, packed in tiers, four to six high, so that the heated air can pass freely through. The time required for drying is from three to five days. When complete the sugar is warehoused, and thence sent to the markets. I must add that the draining rooms are surrounded with steam pipes, at or near the floors, to preserve the requisite temperature for drainage.

The bastards, after being sufficiently drained (also, in most instances the lumps), are cut into small portions by a mill. This is an arrangement of revolving short knives, secured at right angles to the shafts, which latter are two in number, each having eight to ten knives. Below these shafts are two rollers, between which the sugar is passed; by this means the sugar can either be remelted and refined or sent into the market as moist sugar. Refiners in London generally make refined sugar on the first four days, the remainder of the week being devoted to lumps and bastards, the latter being the refuse of the days' work, together with the coarsest sugar. Having thus far briefly described the ordinary course of the colonial and home processes, I will now allude to the machinery employed for those purposes.

Colonial Machinery.

To enable a correct conception to be formed of the type of machinery required for the colonial produce, I will now describe each portion consecutively; before doing so however I will now run through the synopsis of the following requisitions. 1. Steam boilers. 2. Sugar-mill, engine, gearing, cane-carrier, and ching pump. 3. Clarifiers. 4. Bag filters. 5. Heating tanks, open evaporators, or vacuum pan, and, if the latter, engine and air-pumps. 6. Charcoal filters. 7. Centrifugal machines. 8. Tanks, moulds, scum press, coolers, or heaters, as may be required, condensing box, and expansion valve. 9. Charcoal furnace and washing apparatus. 10. Casks, cases, bags, trucks, and wains. The detailed description must be my next endeavour.

1. Boilers.—These are of two classes, cylindrical and tubular; the former is the most simple, while the latter will generate more steam proportionately. The planter should not choose complication, unless he has available means for repair, material, &c.; hence, in my own practice I always introduce the Cornish boiler (internally fired), as being the most durable and simple to manage. Boiler fittings should be as effective for the planter as possible, consisting of two lever safety valves, and a steam guage for the pressure of the steam, guage glass, and valves for the indication of the water, surface and bottom blow off, and feed relief valves, main steam stop valve, man hole, furnace, flue and mud doors, damper, fire bars, bridge, and Donkey feed pump.

2. Sugar Mills are now of one type only, with few exceptions, the three rolls being horizontally located in the frames. The principal portion to be considered by the engineer is the strength of the side frames, and the removal of the rolls without disarranging the former. Space will not permit my going into this matter in detail; suffice it to say that the planter has great cause to acknowledge the advantage of the present over past examples of sugar mills. The type of engine mostly adopted is the beam, for large mills; the horizontal and vertical for the lesser kind. In my own practice I prefer the horizontal high-pressure engine, with suitable spur-gearing, the largest wheel being, in all cases, under twelve feet in diameter. The cane-carrier is simply a series of rollers on which the cane is laid; it is obvious that on motion being given to the rollers, the cane will be propelled in the required direction. The ching pump receives its motion either from the top roll shaft or the gearing shaft, the latter being the preferable, as well as the later arrangement.

3. Clarifiers.—These are introduced to the planter to supersede the teache and battery heated by fire. The arrangement of the clarifier of late construction is a semicircular bottom, encased in one of larger proportional dimensions in depth than in diameter. A worm or coil of pipes is located in the bottom, extending nearly to the top, there being a light course of metal above the flanged connection. The steam passes through the worm, and from thence into the space between the bottom and jacket, and thus an almost double effect is attained. I may add that in some instances the worm is dispensed with, but I prefer its adoption. The jacket should always be fitted with safety, air, and steam valves, also a discharge plug, and a two way-valve in the bottom for the exit of the scum and liquor.

4. Bag or Bell Filters.—The casing is shaped as an ordinary box, having parallel sides and ends, the top being open. The bags are of canvas, open at the top, and secured to the bells with strong cord or wire. Each bag is enclosed in another, open at each end, to support the one containing the impurities. The bells are cylindrical portions, enlarged at the lower end, to sustain the grip of the bags. The bells are screwed into the plate placed in the casing for their reception. The liquor, on leaving the clarifiers, passes direct into the bags, through the bells alluded to. The casing should in all cases be provided with steam-tight doors and a steam jet valve, to retain the temperature of the filtering liquor.

5. Heating Tanks.—These are simply for the accumulation of the liquor in its passage from the bag-filter to the evaporating pan. A coil or worm of pipes is located in the bottom, steam being introduced to preserve the temperature of the liquor. Steam and discharge valves are suitably located to obtain the effect required.

Open Evaporating Pans.—It is difficult to point out any portion of the plant for a sugar plantation that has received more popular attention than these vessels. When the requirements are considered, this is not to be wondered at. The object sought after is the perfect evaporation of the water in the liquor at a given

temperature. Patents innumerable have been granted for this purpose, all the schemes professing to attain the same results. The prevailing idea amongst the advocates of the open system of evaporation is, that by constant agitation and exposing the heated liquor in thin films to the atmosphere, the desideratum is effected. Now to produce this effect, discs are mostly used; these revolving in the liquor retain some portion on their surfaces, and thus evaporation is greatly accelerated. The arrangement of the entire portion is generally thus: A vessel, either of a flat bottom or semicircular form, encloses one of less dimensions, thus a space between each is retained. The inner vessel is open at the top for its length and breadth; a shaft is centrally—of the width—supported on suitable bearings. Discs of thin metal are secured on the shaft in question; the diameter of these discs is a little less than that required to clear the inner surface of the pan. The syrup is put into the inner vessel to a given depth, and steam is introduced within the space alluded to. On motion being imparted to the shafts the discs will revolve and the heated liquor will adhere in thin portions to the surface, thus a great amount of the fluid is exposed to the atmosphere, while the remainder is being heated below. It may be added that the evaporation being thus effected is the cause for the various arrangements. In order to increase the heating surface worms or coils of pipes have been introduced within the pan, the steam from the worm surrounding the same as before. To produce greater evaporation than by plain discs those of a corrugated surface have been introduced. Not contented with this, inventors have proposed, and indeed made, hollow discs, filling them with steam or boiling water. Other proposals have been started, such as to dispense with the discs and evaporate in flat pans, worms, &c. Indeed, further than this, steam belts have been suggested, *i.e.* a hollow portion of thin metal, in the form of a belt, supported on rollers at each end. The cavity is filled with steam or water, as may be deemed consistent, and a fire below retains the temperature. The liquor flows on the upper portion of the belt at one end, and at the other is located a skimmer to retain the newly-formed sugar. I could describe many other devices, each claiming attention; but the principle in each case is the same as in those already alluded to.

Vacuum Pans.—The main consideration of the sugar boiler with the open pan is to evaporate below boiling point, or 212°, and even much below this temperature the sugars at a given stage will carbonise. Now, it is obvious that if the sugar or liquid of any kind be relieved from the pressure of the atmosphere, the boiling temperature will be in direct proportion to the vacuum obtained. For example, liquid boiling in an open pan is 212°, is acted on by a pressure of 15 lbs. on the square inch, but on enclosing the vessel and exhausting the air, the ebullition will be increased, while the temperature will be reduced from 120° to 126°, causing an absence of a pressure equivalent to 14.5 lbs. to 13lbs. on the square inch. I have known vacuum pans worked with an absence of 29.3 inches of mercury, or nearly a perfect vacuum attained. This, then, is the theory of the vacuum pan. I will now describe its external and internal arrangements. The form of the pan in elevation is similar to an ellipse; in some instances the lower portion is formed as a hyperbola, but the former is the most popular, simply because it will boil more effectually, while the latter will require two or three worms. The plan, in all cases, represents a circle. I may add that the primitive form was cylindrical, but this has been discarded long ago for the shapes alluded to. The pan is generally in three portions, the first being the casing or jacket; the second, the bottom inserted in the former; and the third, the dome connected to the jacket and bottom by flanges, bolts, and nuts. Below the flange, within the bottom, is a worm or spiral of pipes common to the curved shape of the bottom. The lower end of the worm is connected, to discharge into the space between the bottom and jacket, the upper end being secured to the dome, outside of which is the steam supply stop valve. On the top of the dome is secured the discharge air and steam pipe, termed technically the "arm pipe," extending to a vessel beyond the flange known as the "receiver." Formed with this last is the condenser, into which the steam is finally discharged. The system of condensation is the injection or surface kinds. In my own practice I prefer the injection to any other, owing to the surcharged state of the steam: its simplicity is also a great recommendation. Surface condensers are not objectionable, considering that the injection is equally as efficient, to say nothing of the first cost—a matter of consideration ever in the mind of the planter. I have seen a better vacuum produced, with less air pump power, by locating the condenser at the top of the building, and allowing the fall of the water to assist. To return to the description of the remainder.

At the side of the arm pipe is the man-hole; in some cases it is on the top of the same, but the former position is preferable for entering and leaving the pan. At the side of the flanged connection, opposite the condenser, is located the "measure." This vessel receives the syrup before it enters the pan, a gauge indicating the quantity. To enable the sugar-boiler to see into the pan when in operation, light glasses are placed on opposite sides of the dome. It may now be wondered how the state of the sugar within the pan can be known without stopping the boiling and exhausting. This is attained by an ingenious arrangement, termed a "proof stick." From its name, the casual observer would imagine that this is actually of wood, and simple in shape and construction. On the contrary, it is complicated, and of the best metal, fitted bright throughout. The stick or rod is a copper tube, from the handle to the lower end, where a drilled cavity is formed for about two to three inches in length. The rod is then closed by plugging and brazing. Near the extremity a narrow opening is cut in the side of the rod, thus forming an external communication with the cavity alluded to. I may here state that the rod is inserted in a case or tube connected to the dome and the worm. This casing contains a hollow plug at the inner extremity, for a given length, into which the rod or stick fits. Corresponding openings are formed in the plug and casing. It is obvious then that on turning the rod and plug to agree with the opening in the outer casing, the sugar will flow into the cavity in the rod; and on closing the outer opening, the rod can be withdrawn without affecting the vacuum. The remaining appendages for the vacuum space consist of liquor, air, steam, safety and vacuum valves, barometer and thermometer, sugar discharge valve, condensed steam valve, gauges and valves to the measure, receiver, and condenser. It will thus be seen that the vacuum pan is rather a formidable opponent to the open boiling system, inasmuch as that if the requisitions alluded to are imperative, the neglect of the same must be no common error. To enable the practicability of each detail to be duly understood, I will describe the process of using the vacuum pan for granulating sugar. Presuming a vacuum to be caused in the pan, the valve of the pipe connecting from the tank is opened; also the vacuum valve from the measure to the pan. The liquid sugar rushes into the measure until the gauge indicates the required quantity. The supply is cut off, and the communication from the measure to the pan opened, when the former is soon emptied. Steam is now circulating through the worm and the space between the bottom and jacket, thus heating the syrup. Fresh charges from the measure are added till the pan is sufficiently filled, which, when attained, is termed a "skipping." The amount of sugar that can be granulated in a given trial depends much on the nature of the sugar and the size of the pan. A pan 8 feet 6 inches in diameter, and 10 feet deep, will boil at the rate of about two tons per hour, or three and a half skippings in one day—total, 28 to 30 tons. Presuming the sugar to be

boiling, the process of taking proof is resorted to at suitable intervals. The operator inserts the rod into the pan, with the opening towards him. On turning the rod to the right, the sugar in the pan is received into the rod as much as available; on reversing the action of the handle the rod can be withdrawn. The sugar boiler now holds the lower extremity towards his disengaged hand, before a gas light. The sugar in the cavity is allowed to fall between the forefinger and thumb. On turning them at right angles, and extending the same before the light, the grain of the sugar can be detected during its formation and completion. A basket or small barrel of water is located near the proof-rod casing, in which the rod is put between the intervals of taking proof, also for the purpose of washing the fingers. It may be added, in passing, that a small pan or dish receives the proved sugar from the fingers of the operator. Now, presuming the sugar to be sufficiently crystallized, the discharge valve is opened, also the air or break vacuum valve, and the sugar is let into the vessel for its reception. I may here state that if the sugar is improperly boiled it assumes a semi-liquid state, termed "smear," and in other cases it will "set," or "boil fast," and become so hard in the pan, that the use of pick-axes and shovels is required to remove it, to say nothing of the damage incurred and uselessness of the material afterwards.

Engine and Air-Pumps.—The kind of engine mostly used for working the pumps is the high-pressure beam type. Each pump is single-acting, located on each side of the central support of the beam gudgeon; I prefer using a horizontal pump and engine, the former double-acting: by this arrangement I can produce a certain effect at much less cost than the primitive mode.

6. Charcoal Filters.—These are cisterns of cylindrical form, slightly conical, the lesser diameter being at the base line. A false perforated bottom is secured 12 to 15 inches from the solid termination, above which is the man-hole for clearing the charcoal when requisite. On the top of the filter is a float and stop-cock, to prevent the overflow of the syrup. The charcoal is prevented from being washed through the false bottom, or choking the same, by a piece of flannel placed between the bottom and the charcoal. I have designed these filters with a casing, and, by introducing steam at a low temperature, the requisite heat is preserved to prevent coagulation. The sizes of the filters vary; in some cases 4 to 5 feet in diameter and 10 to 15 feet in height, in some cases 22 feet.

7 Centrifugal Machines.—It will be remembered that in a previous portion of my paper I explained the principle and use of these machines; I now proceed to describe their form and constitution. The shell is cylindrical, open at the top; and the bottom located one-third of the total height from the base-line; the bottom forms a spiral in elevation, to enable the syrup to more readily flow out at the opening at the side. The basket is hung on a cone, which latter is supported on a perpendicular shaft. This shaft revolves on bearings, formed in a separate casting, extending above and below the bottom of the shell to which it is connected. The basket is made solid at the bottom, the sides being a combination formed of wire and gauze-work. The size is about 2 feet 9 inches to 3 feet 6 inches; in some instances larger, the most universal being the former. Their use is as follows: The melted sugar is put in the basket, to the amount of 3 cwt. at once. A speed of 600 to 1,000 revolutions per minute is imparted to the machine, when on stopping the sugar will be found to be in a dry state, adhering to the sides of the basket, and weighing about 2¼ cwt., the remainder being the syrup. I may add that a steam jet is sometimes used to preserve the temperature of the sugar during the operation of drying or draining. Now with reference to the means for imparting the motion to the machine in question: The primitive mode has been by gearing, belting, pullies, and the paraphernalia requisite. This has been surpassed by small engines of the requisite power, either being connected direct or making good the motion by belting. In some instances horizontal engines are adopted; other authorities prefer perpendicular power and bevel gearing; while a third has advocated the flow of water through hollow avenues, being a compilation from the idea that Hero of Alexandria had for producing rotary motion. I may here state a patent has been granted for this latter mode of causing centrifugal motion. In my practice I prefer a horizontal engine, with a belt and a small pully, the larger acting also as a fly-wheel on the crank shaft, the slackness due to the expansion of the belt being adjusted by suitable provisions.

8. Tanks, &c.—In this clause I have many details to allude to, commencing with "tanks." These are of simple form and construction, either of wrought or cast-iron, fitted or not, as may be required, with heating coils, &c. The "moulds" are conical in shape, and further conical at the smaller extremity to a point. They are made of sheet-iron galvanised, in other cases of cast-iron similarly treated, and in some instances of copper, but the latter rarely. The "scum press" is merely a simple screw press of ordinary design and utility. I may here state that hydraulic pressure is being introduced for this purpose with great effect. "Coolers and heaters."—The former is a semi-elliptical vessel, the latter the same form surrounded by a casing. The space between, being filled with steam, heats the sugar at the bottom. "Condensing box."—The title of this detail readily conveys its use, therefore a simple allusion is only necessary. The body or shell is cylindrical, within which is a float of copper, attached to a valve located in the bottom of the casing. The steam (to be condensed) enters at the top of the vessel and the injection water opposite. The vapour and the fluid amalgamating cause the float to rise, and thus the requisite discharge ensues. "Expansion valve."—The utility of this valve is to admit the steam at one portion at a given pressure and at another discharge the steam reduced to the requisite temperature simply by expansion. Arrangements innumerable have been introduced to attain this desideratum. Patents have been granted to protect the same, each device of course claiming the recognition of the law. Mercurial valves have been introduced; slide, cylindrical, and disc valves have had trial, but fail more or less, owing to one cause, viz., friction of the working parts. In 1863 I invented an expansion valve, which greatly eradicated the evils alluded to, but being founded on the faults of its predecessors, I cannot lay claim to much originality. Suffice it to say, the valve in question dispenses with stuffing boxes, levers, and slides, each of which is conducive to friction; they are therefore great barriers to the correct indication of an expansion valve.

9. Charcoal Furnaces.—When allusion was made to the liquid sugar being filtered through the charcoal, it was obvious that the impurities were left behind. It is now my purpose to describe the removal of the refuse of the sugar in the charcoal. Before doing so, however, I will give a brief description of the chemical properties of the bone. In so doing I must quote from an article entitled "A Visit to a Bone-Boiling Factory," by myself, inserted in the *Technologist*, October, 1863:—

"The decomposition of bone by heat in close vessels, whereby the action of atmospheric air is excluded, is well worthy of minute attention, both in consequence of the large scale on which it is carried on as a chemical manufacture, of the importance of the products obtained, and the interest which it possesses in a scientific point of view.

"The animal matter of bone is the only constituent part of this substance capable of decomposition by a heat brought up to low redness; in considering, therefore, the action of close heat on bone, the earthy ingredients may be considered as passive. The animal matter is either a substance analogous to skin, or is a mixture of membrane and jelly; the former opinion is supported by some of the

most eminent modern chemists, but it is of no sort of importance to our present purpose which opinion is adopted, as all three substances are composed of the same ultimate elements, and nearly in the same proportion. The four simple substances, then, of which the animal matter of bone is composed, are carbon, hydrogen, nitrogen, and oxygen; and of these the three latter, when in an uncombined state, and at the usual temperature and atmospheric pressure, are in the form of gas. Now when it happens that these substances, habitually gaseous, are combined with one naturally solid, and when these four substances are likewise capable of uniting together by twos or threes, or, in other words, of forming binary and ternary compounds, the attraction that holds together all the four is easily disturbed by a moderate increase of temperature; in consequence of which the same elements, by arranging themselves differently, produce two or more different substances.

"This is the case in the present instance. On exposing bone shavings even to a lamp heat, they are observed immediately to become black, showing that the new compounds that are the result of this decomposition are not capable of combining with the whole of the carbon, but that part remains in a state of charcoal intimately mixed with the earthy matter. The mixture goes by the name of bone black or animal charcoal.

"Part of the carbon combines with part of the oxygen, and forms carbonic acid, while part of the hydrogen and part of the nitrogen produce ammonia; the carbonic acid and the ammonia, as they are formed, combine and produce carbonate of ammonia, which, therefore, is another of the useful substances resulting from the decomposition of bone. Part of the oxygen and hydrogen combine and produce water; and part of the oxygen, the hydrogen, and carbon, by combining, produce an oil of a strong and peculiar odour, which goes by the name of animal oil. The remainder of the carbon and hydrogen, with probably some nitrogen combine, and produce an inflammable gas. Thus the decomposition in close vessels, of the single substance, bone, produces five new substances, namely; animal charcoal, carbonate of ammonia, animal oil, water, and an inflammable gas."

Now the mode of revivification is by reburning in closed vessels, allowing the gas to escape into suitable air-tight receptacles by exhaustion. The arrangement of the retorts for the colonies is often with elliptical pipes, vertically secured in brickwork. The charcoal is put in each retort, which, when full, is hermetically sealed, and the gas is condensed, or rather consumed within the retort, with the exception of that which escapes through the bottom. A test pipe indicates when the charcoal is sufficiently burnt, and on withdrawing the bottom slide the charcoal can be readily emptied into cisterns. The mode is, perhaps, the most simple that can be conceived, and is much used in the present day. Within the last few years great improvements have been made; the aid of the engineer has been resorted to. As far back as 1846 revolving retorts were introduced, and since that period have gradually been extended in adoption. The first mode was to hang the retort on chains, suspended on revolving pullies; motion being imparted to the latter, caused the cylinder to revolve within a furnace. The retort was charged at the front end, and the gas escaped at the other into water, being conveyed thereto by a pipe. The great fault with this arrangement is the crudeness of the machinery, and exposure of the charcoal to the atmosphere when discharging. Messrs. L. Cowan and Sons have a very good arrangement of single retorts. Mr. George Torr, of charcoal repute, has an arrangement of double retorts, or one above another. The upper retort receives the charcoal, partially cleanses it, and the lower retort completes the process. The inside of each retort has cast with the body a spiral throughout, and thus the charcoal is self-traversing, both feeding and discharging. Mr. J. F. Brinjes, an engineer, who has devoted much attention to the machinery requisite for the purposes alluded to, adopts two retorts, similarly arranged to Mr. Torr's, but in this case a mangle motion is deemed by Mr. Brinjes to be preferable, suitable provisions being formed internally. Space and time will not admit my entering further into this matter in detail, but I must conclude by stating that the amount of charcoal revivified by Mr. Brinjes' arrangement in one week is 90 tons, requiring 10 tons of fuel. This may be said to be a great advance, showing that science was sadly neglected, when, with twenty fixed retorts, only one ton of charcoal was revivified in twenty-four hours, consuming one ton of coals to five of charcoal.

10. Casks.—The details in this clause are of such an obvious character, that I may briefly state that the crafts of the carpenter and cooper are only requisite, and therefore they need no farther comment here.

Home Machinery.

The machinery I have just alluded to completes the process of refining in the colonies; therefore, with the exception of the cane mill and clarifiers, duplicates are required for home manufacture. The first requisition in the present case is the blow-up pan, being cylindrical or rectangular in plan, fitted with a perforated false bottom, underneath which is a worm. A vertical shaft, having arms, agitates the melting sugar, and thus greatly accelerates the process. I may here add, that an ordinary pan will blow up, or melt, four tons of sugar in one hour. The origin of the term "blow up" was taken from the fact, that the sugar used to be exposed to jets of steam blowing up through the perforated bottom. Such a practice produces molasses. I will now allude to the arrangement of the machinery.

For colonial practice much depends on the locality, the class of sugar to be produced, and divers other considerations. The main portion to be noticed is the accessibility to all the working parts, also the removal of any part without disarranging the neighbouring portion. As most of the process is carried out on the ground floor, platforms and stages are imperative. Glass windows should never be introduced, due to the heat and scarcity of the material for repairs. The rule for arranging the machinery for home practice is generally the least area with unlimited height, or the reverse of that for the colonies. Having thus far investigated the subject I have had the honour of bringing under notice, I will next allude to the prices, both of the machinery and sugar. According to reliable authorities, the component portions of the sugar cane consist of

Woody fibre, &c.	10
Water	72
Sugar	18
	100

Now the sugar mill does not extract the entire liquid; indeed some assert that out of 90 per cent. of juice known to exist in the cane only 60 are extracted. With the improved machinery now in existence 70 to 75 per cent. can be ensured, remembering that the speed of the roll should be in just proportion to the nature of the cane; in fact, when this has been observed, 85 per cent. of juice has been extracted. In round numbers 1,800 to 2,500 gallons of cane juice will make one hogshead of raw sugar, weighing sixteen to eighteen cwts., and in some instances a higher standard has been produced.

To enable a fair price to be given for sugar machinery, many contingent expenses must be added to the actual requirements. I give the following estimate for a perfect colonial sugar factory, producing ten to twelve tons of refined sugar per diem, exclusive of the building and erecting:—

Three boilers and fittings	£1,200
One high-pressure engine	560
One cane-mill and gearing	2,100
Three steam clarifiers	1,200
Three bag filters	400

Six charcoal cisterns	360
Two vacuum-pans	2,000
Two air-pumps and engines	700
Two heating-tanks	280
Three plain tanks	200
Two heaters or coolers	220
Six centrifugal machines and engines	960
Steam piping, troughs, expansion-valves, condensing-boxes, scum-press	1,800
Four revolving retorts	560
	£12,649

A refinery at home to produce twenty tons of refined sugar per diem will cost about £8,000—fitted complete.

PRICES OF COLONIAL AND FOREIGN SUGAR.

West India.

Name of Colony.	Kind of Sugar.	Price per cwt., duty paid. s. d. s. d.
Jamaica	..	30 6 to 36 0
"	Fine	36 6 " 37 6
Barbados	..	30 0 " 39 0
Trinidad & Antigua	..	29 6 " 33 0
"	Fine	34 0 " 36 0
Demerara & Berbice	..	29 6 " 35 0
"	Crystallized	35 6 " 40 6
St. Kitt's and St. Vincent	..	29 6 " 35 6
Dominica & St. Lucia	..	29 0 " 33 0
Surinam	..	29 6 " 34 0
Havana	Brown	32 0 " 34 0
	Yellow	34 6 " 38 6
	Florettes	39 0 " 41 0
Porto Rico & Cuba Muscovado	Fine	36 0 " 40 6
	Yellow	34 0 " 36 0
	Brown	29 6 " 33 6

East India.

Name of Colony.	Kind of Sugar.	Price per cwt., duty paid. s. d. s. d.
Bengal	Factory mid. to fine yellow	34 0 to 41 0
	Benares, yellow and white	33 0 " 39 0
	Date, yellow	30 6 " 35 0
	" brown	24 0 " 29 0
	Khaur	24 6 " 26 0
Madras	Factory, yellow and white	33 0 " 41 6
	Brown and soft, yellow	25 0 " 29 6
	Jaggery	24 0 " 26 6
Mauritius	Crystallized	33 6 " 40 0
	Yellow and grey	30 6 " 34 6
	Brown	25 0 " 30 0
Penang	Grey and white	34 0 " 38 6
	Yellow	31 0 " 34 0
	Brown	26 6 " 30 0
Siam and China	Yellow and white	31 6 " 40 0
	Brown	25 6 " 30 0
Manilla	Currant clayed	29 6 " 30 6
	Muscovado	25 6 " 27 0
Java	Grey and white	35 6 " 40 0
	Yellow	31 6 " 35 6
	Brown	27 0 " 30 6

Before concluding my paper, I may state that, although rapid improvement has been made, much yet remains to be accomplished. This fact presents itself more vividly when I see the small amount of refined sugar produced in proportion to the quantity of cane cut. This also clearly shows that there must be a fault in the manufacture, as well as in the machinery. I would suggest to the planter, and more particularly to the refiner at home, that they injure their own interests by making such a mystery of their art, which, I am aware, is one of the most worthy of development. I am also confident that much is due to the arrangement of the plant; and that but little progress would have been made in sugar machinery had it not have received the attention of the English engineer.

DISCUSSION.

Mr. P. L. SIMMONDS said that it must be admitted by all present that the subject discussed that evening in its several relations was one of great importance, not only to this country but the world at large. Enormous as the production of sugar already was, yet with the increase of population and the progress of colonisation it would still advance. It was an article of consumption for which there was always a steady, and, with low duties, an increasing demand. It was not only in our own tropical colonies that cane sugar was largely produced, but in almost all tropical and sub-tropical countries more or less was made, in some cases in a very rude and primitive manner, in others by more scientific processes and improved machinery. The British and foreign West India colonies were long the main sources of supply for Europe, and his experience as a sugar planter, extending back some thirty years, brought to mind the rude crushing mills, worked by cattle power, and the very raw muscovado, with a great quantity of "foots," and large drainage of molasses, in potting and curing, resulting from sugar made chiefly under negro management in open boilers. How great was now the change in manufacture was shown by the beautiful specimens of crystallized sugar produced in Demerara, the French West India colonies, Réunion, and especially Mauritius, which were before them on the table. Glancing at the sugar production on the American continent, it might be stated that in the Southern States of America there was formerly a large production of cane sugar, which was not likely to be maintained from the want of labour. The Americans were now turning their attention largely to the production of sugar from the sap of a species of Sorghum cane; but although this might answer on a small scale for domestic use, like the maple sugar, it was never likely to come into extensive competition with cane sugar. More southerly on the American continent, a good deal of sugar was made;—in Mexico, the Central American States, Peru and Brazil. In the Sandwich Islands there was a very creditable production, which was chiefly shipped to California. The French were also pushing sugar cultivation in some of their colonies, Tahiti, the Marquesas, and New Guinea. In parts of Africa some attention was given to sugar cultivation, especially in Egypt, Liberia, and in Natal, from which there were some creditable specimens on the table. But it was towards the East that sugar production was now largely converging,—from the great advantages of abundant and continuous cheap labour. Some of the purest sugars in the world were now produced in the Islands of Bourbon, or Réunion, and Mauritius. The latter was the first colony to avail itself of all the improved and most expensive sugar machinery, both from England, Scotland, and France, and there was no colony in which sugar manufacture was carried on in so scientific a manner. Proceeding eastward, Madras and Bengal were considerable producers of sugar, as were the Spanish and Dutch colonies in the Eastern Archipelago. In Siam, China, and Japan the manufacture of sugar was much larger than was generally supposed. Some of the recent commercial reports from our consuls in China gave interesting details of the sugar production and trade of China. It might naturally be asked why, when such very superior white sugar could be made, and was largely made, in our colonies—so large

a proportion (four-fifths) of that imported should be of the lower quality of brown Muscovado, or below brown-clayed. One reason was, that there was a difference of about 3s. per cwt. in the rates of duty, and this shut out much of the better prepared sugars from our market, causing all the superior Mauritius to be sent to Australia, and our British refiners did a large amount of profitable business in converting the crude raw sugar into the loaf sugar which was before the meeting. There was no reason why the whole refining processes might not ultimately be carried on in several of the colonies with great advantage and economy of material and freight. There were sugar refineries now in operation in Melbourne and Sydney, and specimens of this produce were before them. Although it was scarcely to be expected that the Chancellor of the Exchequer would be prepared to yield any further concession in the sugar duties for some time to come, every reduction stimulated consumption; thus he now received as much revenue, at less than one-half the former rate of duty, as was obtained in 1844, when the average rate of duty stood as high as 25s. 2d., against 11s. 1d. now. This resulted from the imports having doubled, and there could be no doubt that if a better class of refined sugar could be cheaply obtained, it would be as generally used as the protected refined sugar was now on the continent, instead of raw colonial sugars. Every improvement that could therefore be made in sugar machinery, and every publicity that could be given to improvements, were most important, and the thanks of the Society were due to Mr. Burgh for bringing this matter so ably before them.

Mr. Henry Maudslay remarked that he had a very early remembrance of the ponderous machinery which was formerly used to extract the juice from the sugar-cane, but it was now much improved, its construction forming a special class of engineering in this country. In different countries, different methods of preparing the sugar were adopted, and he felt that he could add nothing to what had been so fully stated in the paper descriptive of those processes. It had been very truly remarked, that before the Exhibition of 1851, where for the first time the public had an opportunity of seeing specimens of sugar machinery, very little was generally known about the nature of that machinery, although the whole subject was one of great interest and importance, as affecting an article of such universal use; for owing perhaps to the jealousies and competition of the trade, sugar refiners in this country considered it undesirable to allow the public to inspect their works. Since that period he believed the subject had been more generally attended to by engineers in this country; immense improvements had been made in the generation of steam, in the machinery for crushing the cane, in the use of the centrifugal machines for defecation, and in arrangements for the other processes employed in the preparation of sugar. He might mention that the machinery employed in New York was the most beautiful that could be imagined for producing the crystallized fruits with which all were familiar, and for the production of which special arrangements were required. As far as his own knowledge of the mechanical portion of the paper went, he would say it appeared to him that the descriptions given were so complete that very little remained to be added.

Mr. John C. Wilson, without desiring to detract at all from the merits of the paper, begged, as one who had had some experience in this class of machinery, to point out what he considered were defects in the plans submitted by Mr. Burgh. He would commence with that of the sugar mill, which Mr. Burgh called "improved;" but for his own part he was unable to see wherein the alleged improvement consisted. The great objection to the old description of sugar mill was that the different parts of the machinery were disconnected from each other, and were attached to separate foundations, and this was not obviated in Mr. Burgh's plan. There was necessarily a very severe strain through all the parts of a sugar mill, and when the foundations were separate the brick-work was liable to give way, and the machinery was then put out of truth and breakages resulted. His own idea of an improved mill was that all the parts of it should be combined on one substantial iron foundation bed, so that the great strain was taken through the solid mass of iron. He observed that the side-bearings of Mr. Burgh's mill were, what he considered, of an antiquated description, weak in construction, and liable to break down, and it appeared that the lower rollers were not easily removable for cleaning the mill. Another point in this machine was the coupling between the gearing and the sugar mill, which he thought should be dispensed with. It was an inconvenient and dangerous thing, and there was not the slightest use in it. If the lowest wheel was fastened on direct to the top roller shaft, it answered all the purpose, and saved complication and expense. The boilers advocated by Mr. Burgh were of the Cornish description, but he (Mr. Wilson) had found them to be not well suited for burning the bulky fuel, megass which was used in the colonies, for to do that properly a very high fire-place was required, so as to give considerable space between the fire-grate and the bottom of the boiler. He observed that the chimney was of wrought-iron, which he considered to be a great defect. In the earlier stages of his experience he sent out a wrought-iron chimney, and the report of his agent was that it melted away and totally disappeared. He also observed that in Mr. Burgh's plan there appeared to be no means provided for lifting out, for cleansing purposes, the steam pipes by which the clarifiers were heated. In the process of clarification there was a great amount of sediment deposited, and unless there were means of lifting out the steam-pipes at the end of each clarifying operation, this could not be removed. It was stated that the milk of lime was used to prevent the fermentation of the liquid sugar; but he thought this was a mistake. It was rather used to coagulate the albumen of the juice, which, when thus coagulated, fell to the bottom of the clarifier. It was stated that the vacuum-pan was adopted as a means of boiling the juice in less time; but the great advantage was that it boiled at a lower temperature than the open pans. Mr. Burgh had spoken of the reluctance of engineers to give information on this subject. This, however, was not surprising; the practical information which engineers required with regard to this machinery was often obtained from abroad, through the medium of agents sent out at considerable expense, and it was not to be expected that they should offer that information gratuitously to everybody. They were quite ready to give information, provided it did not involve the giving away of that which they ought not to give away in justice to themselves and their business.

Mr. Botley mentioned that some years ago, wishing to give a lecture on the manufacture of sugar before a Mechanics' Institution in which he was interested, he personally experienced the reticence spoken of on the part of the refiners, and found that they were very reluctant to allow persons to inspect their works. The greatest improvement which had been effected in the refining of sugar, he believed was that which was patented by the son of the Duke of Norfolk in the last century; that was the vacuum pan. He believed that discovery led to the first production of refined sugar in the form of the loaf. It appeared to him, from the little insight he had gained into the subject, that there was still room for improvement in the machinery employed in this important manufacture; and he agreed with the author of the paper, that if the refiners were less chary of admitting people to see their works, they might gain some new suggestions which would be advantageous to them.

Mr. Ogilvy thought that, looking to its practical importance, the invention of Mr. Fryer alluded to in the paper was deserving of a more extended notice than had been given to it. The article produced was a species of

grey lump, called "concrete." In the manufacture of sugar the object was to produce the saccharine portion of the juice in a crystallized form, and for this purpose the separation of the water was effected by heat; but if the heat was carried to too high a point it either destroyed a portion of the sugar, or converted it into molasses or treacle. Mr. Fryer found that if he could keep the temperature below 140° Fahr. little or no molasses would be produced, and his object then was to evaporate the water without exposing it to a high temperature. It was well known that if a quantity of water were put into a saucer, and exposed to the sun, it would be a long time before the water would evaporate, but if the same quantity of water were thrown upon the stones of a yard it very soon dried up. Mr. Fryer had applied this principle to his process in this manner:—The juice as it came from the expressing machine was received upon a large iron plate—say 30 feet by 6—in which there were a number of divisions, forming a long continuous channel, so that the juice might flow from one end of the plate to the other. Under this plate the furnace was placed, and the temperature was kept low. The extent of surface over which the juice passed caused the water quickly to evaporate; and by the time it arrived at the end of this iron plate, as much as eleven-sixteenths of the water was got rid of. The sugar was then placed in a cylindrical vessel, in which it was kept in continual agitation, exposing a large surface to a blast of hot air passing through the cylinder, by which means the whole of the remaining moisture was speedily carried of; the syrup was then finally passed over a drum, where it was again exposed to heat, and the process was complete. A scraper was placed in front of this drum, to scrape off the sugar. By these means a beautiful article, of a grey colour, was obtained, entirely free from water, and containing very little molasses. He regarded this process as a great revolution in sugar manufacture, and it had been highly approved by those West India planters who had seen it.

Mr. Gadesden said, though he was one of those exclusive individuals of whom it was remarked that they wished to keep prying eyes out of their establishments, he would venture to go a little further in explanation of Mr. Fryer's new process than the last speaker had gone, probably from not being acquainted with the latest modifications of that process. In the first place, it was stated that the fire under the flat plate over which the liquor passed in a thin stream was not very powerful. The fact was, the heat might be as powerful as the energies of coal and air could produce; they might have white heat under it without doing damage to the juice, either in colour or in composition. Moreover, the exact amount of crystallized sugar which existed in the cane would be found to exist in the solid "concrete" produced at the end of the process. As far as Mr. Fryer's experiments had gone at present, he had used the syrup at a density of 16° Baumé. Even a mixture consisting of less than one part of water to one of sugar might be subject to a high temperature without any injury to it whatever, provided there was sufficient evaporating surface. When the syrup had been reduced to that density, the remaining water was drawn off by passing a current of air at a temperature of 800° over it in a rotatory cylinder provided with apparatus for dividing the liquid into fine streams. He might add that Mr. Fryer had found under these circumstances that the drum spoken of by Mr. Ogilvy as forming the last process was not necessary, the drying in the cylinder being found sufficient to cause the sugar to coagulate into a hard mass the moment it was cooled, when it was fit for shipping, the whole process being effected in one day, from the cutting of the cane to the shipping of the article. That was an enormous advantage, which those unconnected with the business could hardly appreciate. In the first place the quality of the sugar was not deteriorated, and, in the next place, all the sugar that the cane contained was delivered into the vessel, and there was no loss from drainage on the passage. By the ordinary process of manufacture not more than 66 per cent. of the sugar found its way to the consumer; the remaining portion being lost by conversion and degradation from sugar to molasses, as well as by drainage during the passage. The process of Mr. Fryer must be regarded as of great value, and he could speak much for the results he had mentioned, from personal experience of its efficiency.

The Chairman said it would be presumptuous on his part to detain the meeting with any observations on a subject with which he had no practical acquaintance as a planter or manufacturer, but thirty years' of official connection with our sugar producing colonies in the West Indies had given him an abiding interest in their prosperity, and he rejoiced at any opportunity which presented itself of manifesting that interest. The well-being of those portions of our possessions was intimately connected with sugar production, and he felt much indebted to a gentleman like Mr. Burgh, who took the trouble to bring before the public matters in which the interests of our colonies were so deeply involved. It was obvious, from what they had heard this evening, that improvements in machinery for the manufacture of sugar were possible. He had no doubt that even at the present day in some parts of the colonies they would find the old wooden mill in use, driven by mules, expressing the juice from the cane, as far as such imperfect appliances could do so, the juice being put into skin bags, and carried by the mules to the shipping ports. There could be no doubt that the British planter was overweighted in the race of competition. The object was to produce this commodity as cheaply as possible; but we must bear in mind that every improvement in machinery was available to competitors, who had the advantage over British planters in the matter of labour, and he believed the true remedy of the difficulty would be found in those halcyon days which he hoped were looming in the future—when the Chancellor of the Exchequer would find himself in a position to be able to dispense with the sugar-duties. That, together with the total abolition of slave labour, which he hoped was not far distant, would place the British producer on a footing of equality with his foreign competitor. Having no private interest to serve, he might be permitted to say that a class of men more intelligent, more energetic, more liberal and willing to adopt every possible improvement, either in the cultivation of the cane or the manufacture of sugar, could not be found anywhere than the planters in the British sugar-producing colonies. He had now to ask the meeting to accord their cordial thanks to Mr. Burgh for the very interesting and able paper with which he had favoured them.

The proposition having been unanimously agreed to,

Mr. Burgh, in acknowledging the compliment paid him, said it appeared to him that if the Government were to lower the sugar duties there was no doubt that the producers abroad would send refined sugar to England. As regarded beet-root sugar he did not think at present its manufacture had been fairly carried out, because he found, from experience, it was not only bad in smell, but bad in taste also. In reply to the criticisms which had been passed by Mr. Wilson upon the machinery described, it seemed to him that that gentleman had not examined the drawings accurately; for the arrangement of the mill and gearing which he (Mr. Burgh) recommended was, in fact, more simple and effective than any other. He did not say it was entirely his own, for he had seen others similar to it, but he had made some improvements, and consequently was warranted in calling it "improved." Then, again, Mr. Wilson disapproved of the disconnection of the machinery, but he (Mr. Burgh) had been requested by planters to provide disconnecting gear, because, in case of accident, they liked to be able to disengage immediately.

With reference to another objection made by Mr. Wilson, that the lower rollers were not readily removable, he could only say that with his arrangement this had been effectually provided for. As to the wrought-iron chimney, it was now coming into general use in the colonies, and there must have been some mistake in the instance referred to by Mr. Wilson in the setting of the boilers and in the proportions of the flues. Then as to the clarifiers, it was objected that the worms could not be lifted out; but here Mr. Wilson was in error; this had, in fact, been provided for. As to the vacuum-pan, he maintained it would boil the liquor in less time, as well as at a lower temperature, and would produce better sugar than the open pan.

The paper was illustrated by numerous specimens of the raw and refined sugars of commerce, lent by Mr. Burgh; also by specimens illustrating the whole process of refining, lent by Mr. Burgh and by Messrs. L. Cowan and Sons, of Hammersmith Bridge Works; also by very fine samples of the superior sugars of Mauritius, kindly lent by Mr. James Morris; also by samples of the various prize sugars shown at the Exhibition of 1862 and at the Dublin Exhibition of 1865, with many curious illustrations of the maple, beet-root, and date sugars, potato sugar, glucose or grape sugar, gluten or starch sugar, Chinese and Australian sugars, from the collection of Mr. P. L. Simmonds.

METHODS OF MUSICAL TEACHING.

The following is from the *Athenæum*:—

7, Hamilton-terrace, March 20, 1866.

I hope you will allow me a few lines' space for illustration of the views I stated in my former letter,—namely, that in a national Musical Academy every Professor should teach according to his own method and his own conviction, and none be bound to a fixed text-book that was authorized and enforced by the rules of the institution,—since these views seem, from Mr. Chorley's remarks upon them in the *Athenæum* of March 17, to have been misunderstood, at least by that gentleman. He states, in support of a contrary principle, that the Fugue made no advance from the time of Bach to that of Beethoven. Certainly it did not; but the Symphony made the prodigious progress from its germinal state in the orchestral *suites* of the former composer to its perfection in the masterpieces of the latter. It may be supposed from Mr. Chorley's argument, however, that had the contemplated Academy been established in the time of Bach, and the authorized text-book for the study of composition been then as far as possible perfected in its exposition of the several forms of construction then in use, it would not be unlawful for a Professor of this branch to teach the grand system of musical development exemplified in the Symphony, and to cite the great works of Haydn, Mozart, Beethoven, and Mendelssohn in proof of its capability, its comprehensiveness, and its endless versatility. On the same principle, a text-book, compiled before the time of Bach, would ignore the system of equal temperament; and, albeit the propriety of its adoption has recently been disputed by one of our most esteemed organists, there can be no question that the whole of modern music, including the forty-eight Preludes and Fugues which Bach wrote to illustrate the system, would be utterly impracticable did any other plan of tuning than that of equal temperament now prevail. Again, had a permanent text-book for clavier-playing—whether on the harpischord or pianoforte is indifferent, as regards the laws of fingering—been legalized prior to the innovation of Bach and Couperin, a teacher would now not be allowed to direct his pupils to employ the thumb when playing on the pianoforte, but would surely be at his wit's end to show him how to execute passages without the aid of this essential member. Had the Median and Persian text-book for the violin been enacted when Corelli lived, it would now be forbidden to teach pupils to play higher than D in the whole shift or third position on the string; an anecdote being current that this famous executant refused to play a passage of Handel's which included E on the third leger-line, affirming that this note was not in the orthodox scale of the instrument. Nay, had the text-book for the violin been dated a century later, it would now be treason to such a statute were any professor, to expound the method of fingering, to produce harmonics with an artificial nut, invented by Paganini. Had the rules of flute-playing been paralysed before Boehm effected his admirable reconstruction of the flute, we should now be restricted to the fingering, if not the blowing also, available only for the old instruments, and it would be all but impossible to procure instruments upon which to practise. Had the laws of harmony been petrified two hundred years ago, it would be now a breach of discipline to explain the use of the unprepared dominant 7th, and of the second inversion of a common chord, not to say all the beautiful resources of modern chromatic harmony and melody, with which the discoveries of true genius have from time to time enriched the art. At the date of the foundation of the Royal Academy of Music, no text-book would have provided for the inculcation of the Gregorian modes, which were at that period as entirely out of thought as out of use among musicians, but a knowledge of which has now become indispensable, not only to familiarize us with an important though exceptional branch of music, but to enable us to contend against the clerical influence which strives to enforce this revived remnant of paganism upon general adoption. It is as needless as it would be easy further to multiply facts to prove that text-books, organised for a national academy at any of the periods to which allusion has been made, would be insufficient for the necessary, not to say complete, instruction of musicians in the present day. I will only add to the above, that, since the age of study in an artist's life never ceases, since his whole career may be hoped to be a course of improvement, it would indeed be wantonly arbitrary to insist that, in the utmost maturity of his acquirements, he should teach all and no more than he knew at the dawn of his experience in tuition. Who shall say that the stream of musical progress, whether in executancy, or production, is arrested? Who shall say that the well of musical truth, whence most wonderful facts in the law of combination still continue to be drawn, is exhausted? If, as I trust, no one can be so daring, nay, so mad, as to assert these paradoxes, how can it be reasonable at any given moment, now or hereafter, to enact a code of rules for a course of musical instruction that shall define what is to be taught, and limit the explanations of professors in all time to come? I have sought your indulgence thus far in no captious spirit of opposition to Mr. Chorley, but in the wish so to illustrate my previously-stated views, that they may be fairly judged in comparison with any that may be urged against them. G. A. Macfarren.

Mr. Chorley replies as follows:—

March 26, 1866

It would suit me as little as I suspect it would suit the *Athenæum* to protract a controversy after each party had stated his own views. That Mr. Macfarren has utterly mistaken mine is evident by his meandering back to days when certain branches of the art of music were manifestly incomplete, and by his sarcastically suggesting an imagined academical finality which would then have been preposterous, in order to show the absurdity of my recommendation of some fixed convictions and recognised models. He waves aside the demonstrable fact, that in all the creative arts wherein science has part, there have been great periods, regarding which there can be no dispute; and he, mistrusting the past as an object of study, and its precepts as having authority, would give up masters and scholars (invited to discuss their masters' methods of teaching) to the chances of discovery. So be it, and let all who have acquainted themselves with the history of music and the history of art judge between us, and decide how far I am pedantic and narrow-minded in recommending

unity of counsel and fixity of purpose and opinion as a first necessity to a collegiate body of professors, who are to form the talent of their pupils. Genius, I once more repeat, has no need of academies, but makes rules for itself. These are not models. I here take leave of the subject.

Henry F. Chorley.

Fine Arts.

Art at Lyons.—The population of Lyons is thoroughly impressed with the immense importance of the cultivation of art in the interest of trade. The superiority of the Lyons designs, as well as of the artistic execution of those designs, has long been admitted; and the manufacturers and residents of the town and neighbourhood are indefatigable in their endeavours to maintain the reputation of the town unimpaired. The annual exhibition of works of art is the most important, after that of Paris, in all France. The artistic society of the town, besides establishing and maintaining the annual exhibition, has set on foot competitions in historical painting, the painting of flowers, drawing, the composition of ornament, engraving, and lithography. Towards the cost of these *concours*, which occur after each annual exhibition, the Emperor contributes a donation of a thousand francs; every step made in advance by the Lyonese artists being an important fact as regards the country at large. It is only by such means as this that pre-eminence in artistic manufactures is to be attained or kept.

Manufactures.

Brush Trade—Bristles.—The demand for bristles is daily increasing, while the supply remains stationary. Any new material which will take the place of them would be a great boon to the trade. It is true that many fibres have been, from time to time, introduced into the trade, but one only is used in any large quantities, and that only for very common work. Nothing has hitherto been discovered which can be made use of as really taking the place of bristles in the manufacture of painting brushes, which require the peculiar soft termination of the bristle (technically called the "flag"), causing the brush to lay on the paint evenly.

Commerce.

Bale of Cotton.—What is a bale of cotton is frequently asked, and the answer is not a simple one. Bales of cotton vary in their weight considerably, and the estimate in pounds depends on the source from whence it comes; thus the average weight of the Egyptian bales, the largest of all, is given by Messrs. Travers as 492 lbs.; American, 423 lbs.; Surat, 390 lbs.; Smyrna, 350 lbs.; Madras, 300 lbs.; Bengal, 300 lbs.; China, 240 lbs.; West Indian, 180 lbs.; Brazilian, 160 lbs. Now the variable amount of a bale of cotton has often led to very erroneous estimates with regard to supply and stocks, and it is much to be regretted that some permanent decision on the matter should not long before this have been arrived at by those nations the extent of whose commerce gives them or ought to give them a legitimate and preponderating influence in settling trade customs.

Colonies.

Postal Communication with Australia.—Negotiations are pending between several firms of the highest standing in Melbourne and Adelaide, with a view to the formation of a company to undertake the conveyance of the English mails between Galle and the Australian colonies. From the ample resources, and the peculiar facilities possessed by several of the firms, there is every reason to believe that the service could be successfully undertaken.

Obituary.

George Rennie, F.R.S., the eminent civil engineer, died on the 30th of March, at his residence in Wilton-crescent. He was the son of an eminent father, who established an imperishable name by his great engineering works. Southwark and Waterloo bridges are among those best known to Londoners. He assisted his father in early life in the construction of the London and East India docks, the Plymouth breakwater, the construction of the Bell-rock lighthouse, &c. Mr. Rennie held the high distinction of vice-president of the Royal Society, of which scientific body he was elected a fellow in the spring of 1822. He contributed several papers to the philosophical transactions of that society. He was a member of the Royal Irish Academy, a Fellow of the Geological Society, and belonged to the Royal Academy of Turin and other foreign societies.

Notes.

Autographic Telegraph.—The Caselli apparatus, which remits autographic messages, has been in operation for some time between the two most important places in France, Paris and Lyons, and any person may now communicate by telegraph autographically between these places; the application of the Caselli instruments is about to be extended from Lyons to Marseilles, when the capital will be placed in direct communication with the Mediterranean. The value of such autographic messages can scarcely be said to have been established to the satisfaction of the public, but every extension and improvement in the means of communication is deserving of trial and encouragement, and it is evident that the imperial government regards the first experiment as promising, or the extension now in hand would not have been undertaken.

MEETINGS FOR THE ENSUING WEEK.

Mon..... Asiatic, 3.
R. United Service Inst., 8½. Mr. Michael Scott, C.E., "On Projectiles."
Tues... Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion on "The Maintenance and Renewal of Permanent Way."
Zoological, 8½.
Syro-Egyptian, 7. Annual Meeting.
Photographic, 8.
Royal Inst., 3. Prof. Frankland, F.R.S., "On the Non-Metallic Elements."
Ethnological, 8. 1. Mr. John Crawfurd, "On the Invention of Writing Materials." 2. "On an Ancient Hindu Sacrificial Bull, with inscription, found in the Northern Island of the New Zealand group."
Wed ... Society of Arts, 8. Mr. E. M. Underdown, "On the Piracy of Trade Marks."
Geological, 8. 1. Mr. William Keene, "On the Brown Cannel or Petroleum Coal-seams at Colley Creek, New South Wales." 2. Rev. W. B. Clarke, "On the occurrence and geological position of Oil bearing Rocks in New South Wales." 3. Mr. H. Bauerman, "On the Copper Mines of the State of Michigan."
Graphic, 8.
Literary Fund, 3.
R. Society of Literature, 4½.
Archæological Assoc., 8½.
Royal Inst., 3. Prof. Du Bois Reymond, "On Muscular Contraction."
Thur....Royal, 8½.
Antiquaries, 8½.
Royal Society Club, 6.
Royal Inst., 3. Prof. Frankland, "On the Non-Metallic Elements."

Fri ......Society of Arts, 8. Cantor Lecture. Dr. Crace Calvert, "On the Synthesis of Organic Substances." (Lecture I.)
Royal Inst., 8. Prof. Du Bois Reymond, "On the time required for the transmission of volition and sensation through the nerves."
Astronomical, 8.
R. United Service Inst., 3. Col. R. A. Shafto Adair, F.R.S., "Ireland, her Wars and Strategical History."
Sat ......R. Botanic, 3¾.
Royal Inst., 3. Mr. George Scharf, "On National Portraits."

Patents.

From Commissioners of Patents' Journal, March 30th.

GRANTS OF PROVISIONAL PROTECTION.

Air engines—684—A. V. Newton.
Artificial stone—458—F. Ransome.
Bituminous substances, distilling—756—J. F. Brinjes.
Bleaching—672—A. V. Newton.
Bolts, &c.—680—W. R. Lake.
Boring tools, holding devices for—744—T. A. Mathieson.
Boxes—802—N. Thompson.
Bracelets—762—M. Lowenstein.
Bread plates or dishes—835—J. Thompson and B. Grayson.
Brushes—805—J. Higginbottom.
Card distributor, self-acting—652—E. E. Colley and W. Moss.
Casement and other stays—784—E. Tonks.
Cast iron into steel, converting—798—J. Heaton.
Chains, &c.—632—W. B. Caulfield.
Chimnies and flues—741—S. Jakins.
Coal, mining—807—E. Beacher and J. Gillott.
Cotton, &c., sizing—674—G. Haworth, T. Parrington, and W. Hudson.
Cylinders, tools for dividing wood into—654—N. Thompson.
Diseases, prevention or cure of—169—W. Hibbert.
Disinfecting and preserving fluid—642—V. Larnaudes.
Dredging and elevating machinery—704—S. F. Schoonmaker.
Elastic gusset webs—777—J. Cole, jun.
Electricity, piles for generating—670—G. L. Leclanché.
Fabrics, finishing—833—H. Stead.
Fans or blowers—791—H. B. Barlow.
Felted cloths, bat frames used in making—751—S. Fillingham.
Fibrous materials, balling—823—B. Swain and P. Oldfield.
Fibrous materials, cleaning cotton seeds from—781—F. H. Gossage.
Fibrous materials, preparing—758—L. Kaberry.
Fibrous materials, scouring, &c.—824—T. N. Kirkham, V. F. Ensom, and H. Brook.
Fibrous substances, preparing—808—J. Campbell, S. McKinstry, and T. Wilson.
Fire-arms, breech-loading—714—C. Harvey.
Fire-arms, breech-loading, and in cartridges—688—W. Richards.
Fire-arms, breech-loading, and in cartridges for same—722—T. Restell.
Force pumps—787—T. J. Reader.
Fountains—678—E. Rimmel.
Frictional parts of machinery, covering of—813—C. S. Osborne.
Frying-pans—830—F. P. Warren.
Fulling machines—785—W. and F. Bates.
Furnaces—38—W. J. and N. A. T. Symons.
Furnaces—700—T. Prideaux.
Gas and oil, illuminating—769—G. McKenzie.
Gun and pistol barrels—822—A. R. Burr.
Hemp and flax, breaking—333—A. V. Newton.
Hollow projectiles—826—H. J. Alderson.
Impervious compounds—748—J. Macintosh.
Iron, puddling—702—J. G. Willans.
Iron ships from corrosion, protecting—774—M. J. Roberts.
Lace fabrics, ornamenting—686—C. G. Hill.
Lamp—771—E. Lichtenstadt.
Leather, finishing articles made of—746—C. Linford.
Lithographic printing, machines for—724—J. Marr.
Lithographic stones, grinding—634—W. Conisbee.
Magnetic engines—726—J. Baker.
Mathematical drawing instruments—664—W. F. Stanley.
Matters, diffusing moisture and heat through—811—E. Field and F. Lloyd.
Metallic pistons—716—T. Pattison and J. Booth.
Metal plates—517—J. Nall.
Metal provision cases, travelling knife for opening—599—R. Yeates.
Meters—733—W. C. and E. Myers.
Minerals, cutting—832—S. Dalby.
Mineral oils, distilling—827—W. E. Newton.
Motive power, obtaining—819—J. Ramsbottom.
Ordnance below water level, working—441—J. A. Longridge.
Ordnance, &c., projectiles for—636—G. P. Evelyn.
Paper bags—223—W. Clark.
Paper, pictures obtained upon—797—R. H. Ashton.
Paper, waterproof—675—R. G. Allerton.
Peat—779—T. G. Ghislin.
Phosphorus—660—J. H. Player.
Pillar cranes—828—P. G. B. Westmacott.
Pneumatic steam dredging machine—810—W. E. Gedge.
Preservative coatings—718—A. T. Machattie.
Projectiles and cartridges—834—C. E. Brooman.
Pulleys—841—H. W. Ley.
Pumps—719—E. T. Hughes.
Pumps—736—D. Gallafent.
Purple and blue colouring matters, preparing—732—G. Phillips.
Quantities and amounts, computing—770—T. Wallwork.
Railway crossings—698—W. Thomson.
Railway wheels—803—P. Michaud.
Ratchet-brace—817—W. Dicks.
Rivers, tunnelling under the beds of—770—R. Morton.
Rose engines—653—W. Clark.
Rotary brushes—6.0—S. and C. J. Henton.
Rotary steam engines—839—W. E. Newton.
Safes—694—G. Price.
Safes—754—J. Jessop and W. Warburton.
Safes—799—F. Hinton.
Sails, reefing of—420—J. Davidson.
Sea, saving life at—658—C. Ravelli.
Sewing machines—768—R. Gutteridge.
Sewing machines—788—A. Pilling.
Shears and scissors—795—R. Badger.
Ships' sides and bottoms, cleaning—692—W. and S. Machin.
Show cases—840—F. Sage.
Smoke, prevention or consumption of—821—W. Naylor.
Spinning and doubling—815—H. B. Barlow.
Steam boilers—794—J. Shanks.
Steam, drying—650—J. Pollitt and E. Wigzell.
Steam engines—666—G. Davies.
Steam engines—708—J. B. Muschamp and J. W. Card.
Steam, superheating—682—A. C. Campbell.
Steam vessels—638—W. Clark.
Steering apparatus—626—J. Skinner.
Stoppering bottles—801—C. W. Standish.
Substances, distilling—625—J. Young.
Sugar, refining—842—E. D. Elliott.
Surfaces, laying veneers on—809—J. Chambers.
Textile fabrics, dyeing and printing—793—W. Dancer.
Twist lace machines, making lace in—776—B. W. Selby.
Two-wheel vehicles—644—J. W. Friend.
Vessels, indicating the direction of—843—S. Chatwood, and J. and T. Sturgeon.
Vessels, protecting hatchways in—712—W. Fleming.
Vices—836—C. H. Parker and H. Russell.
Wadding—686—A. Barker.
Waggons, loading—640—A. V. Newton.
Water, distributing—710—W. Russ and T. W. Wedlake.
Weaving, looms for—382—W. S. Laycock.
Weighing scales—720—E. T. Hughes.
Woven fabrics, beetling—780—W. Hutchinson and F. Jolly.
Woven fabrics, stretching—424—J. and H. Charlton.
Yarn, winding and reeling—676—J. Broadbent.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Portfolios and paper files—975—G. T. Bousfield.

PATENTS SEALED.

2522. J. W. Tyler.	2547. W. B. Stocks, J. Whitham, and W. Blakey.
2525. F. Jenner.	2549. J. Webster.
2527. S. C. Salisbury.	2553. J. Millar and B. Benton.
2528. S. C. Salisbury.	2563. R. W. Fraser.
2535. R. A. Brooman.	2571. V. J. B. Germain.
2545. L. Hewitt.	

From Commissioners of Patents' Journal, April 3rd.

PATENTS SEALED.

542. J. and F. J. Jones.	2621. M. Henry.
2546. E. W. de Rusett & R. F. Dale.	2628. J. H. Selwyn.
2548. J. Dodge.	2629. R. Longdon.
2552. H. Hughes.	2630. A. A. Lerenard.
2555. W. R. Barker.	2638. W. Barwick.
2559. W. H. Phillips.	3647. W. Robertson and J. G. Orchar.
2564. J. Holliday.	2734. H. Newman.
2565. L. R. Whitehead.	2750. G. Haseltine.
2576. W. D. Grimshaw.	2761. G. Davies.
2577. T. Machin.	2815. S. Solomons.
2579. C. O. Crosby.	2951. A. V. Newton.
2581. H. G. Craig.	3290. J. Martin.
2596. P. Todd and J. Holding.	17. H. Hirsch.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

816. J. Musgrave.	890. J. L. Norton.
804. J. Taylor, jun.	1080. W. Rodger.
847. E. F. Clarke.	832. H. Hamer.
820. J. Carver.	846. W. H. Phillips.
825. J. Smethurst.	850. J. J. Potel.
833. J. M. Dunlop.	846. J. W. Law and J. Inglis.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

781. J. W. Kelly.	787. T. Taylor.

Registered Designs.

A Waistcoat—March 19—4780—W. Prangley, Salisbury.
The Duplex Gas Burner—4781—March 31—Thomas S. Hall, Truro, Cornwall.

Journal of the Society of Arts.

FRIDAY, APRIL 13, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'Clock:—

April 18.—"On the Diseases of Meat as affecting the Health of the People." By Dr. Thudichum. On this evening Professor Owen, F.R.S., will preside.

April 25.—"On the Perils of Mining, and their possible Cure." By Jabez Hogg, Esq.

Cantor Lectures.

The following is the syllabus of a course of four lectures "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," to be delivered by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture I.—Friday, April 13th.

"On the Synthesis of Organic Substances."

The direct formation of *acetylene* (the most illuminating compound of coal gas), of *formic acid* (the acid of ants), and of *alcohol* (spirits of wine) from mineral compounds. The transformation of *acetylene* into *olefiant* gas, of *formic acid* into *marsh gas* (fire-damp), of *alcohol* into *acetic* acid, and of these substances again into *benzol*, *phenol*, and *napthalin* (products obtained from coal tar), and of *marsh gas* into *acetylene* and *benzol*, &c., &c., &c.

Lecture II.—Friday, April 20th.

"On the Transformation of Neutral Substances."

On the transformation of *starch* into *cane* and *grape sugars*, and also *pectic acid* (with remarks on the ripening of fruits and the production of jellies). On the transformation of *sugar* into *alcohol*, *ether*, *aldehyde*, *acetic*, *formic*, *prussic*, *oxalic*, and *butyric acids* (the acid of rancid butter), and also the conversion of *sugar* into *mannite* (obtained also from manna), and into *lactic acid* (acid existing in the blood and flesh of animals, and also in sour milk).

Lecture III.—Friday, April 27th.

"On the Transformation of Organic Acids and Animal Substances."

The artificial production of *benzoic acid* (found in benzoin resin) from the essence of *bitter almonds* and from *coal tar* products, and its conversion into *hippuric acid* (found in the secretion of herbivorous animals); of *tartaric acid* (the acid characterising cream of tartar), from *sugar of milk* and from *succinic acid* (the acid obtainable from amber), and its decomposition into *oxalic* and *acetic* acids—On the transformation of *citric acid* (the acid of lemons and oranges) into *aconitic acid* (found in wolfsbane)—On the transformation of *malic acid* (which characterises the acid flavour of green gooseberries, apples, and rhubarb) into *fumaric acid* (the acid of common fumitory) and also into *equisetic acid* (the acid found in the marsh horsetail), and, lastly, into *asparagine* (the body found in asparagus and potatoes)—On the transformation of *uric*, *cyanuric*, and *cyanic* acids into *allantoin* (the substance found in the allantoid fluid of cows)—On the artificial production of *urea* (a substance which characterises the liquid secretions of man and of many other animals).

Lecture IV.—Friday, May 4th.

"On the Artificial Production of Aromatic Substances."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadow-sweet*, *coumarin*, and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor*; of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

The lectures will commence at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture.

Art Workmanship Prizes for 1866-7.

The Council have decided to enlarge the basis on which artisans may compete for prizes for Art Workmanship, and have passed the following resolutions:—

Any producer will be at liberty to exhibit, either in his own name, or through his workmen, any work or works as specimens of good workmanship in the classes given below, provided that the work or works be accompanied with a statement of the name or names of the artisans who have executed their respective portions; and if the work or works be sufficiently meritorious to deserve them, extra prizes will be given to the artisans who have executed them.

Artisans may, if they think fit, exhibit works executed by them after other designs, in any of the above-mentioned classes. Such works may contain the whole or portions of the prescribed designs, and must be of a similar style and character. Competitors must specify the class in which they exhibit. Extra prizes will be awarded.

The works submitted must be delivered at the Society's House on or before the 22nd December, and will be exhibited at the Society's house, and afterwards at the South Kensington Museum. A selection of the best works will be made and sent to the Paris Exhibition of 1867.

The Classes will be as follows:—

FIRST DIVISION.

Works to be Executed from Prescribed Designs.

Class 1.—Carving in Marble, Stone, or Wood.
Class 2.—Repoussé Work in any Metal.
Class 3.—Hammered Work, in Iron, Brass, or Copper.
Class 4.—Carving in Ivory.
Class 5.—Chasing in Bronze.
Class 6.—Etching and Engraving on Metal—Niello Work.
Class 7.—Enamel Painting on Copper or Gold.
Class 8.—Painting on Porcelain.
Class 9.—Decorative Painting.
Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.
Class 11.—Cameo Cutting.
Class 12.—Engraving on Glass.
Class 13.—Wall Mosaics.
Class 14.—Gem Engraving.
Class 15.—Die Sinking.
Class 16.—Glass Blowing.
Class 17.—Bookbinding and Leather Work.
Class 18.—Embroidery.
Class 19.—Illuminating.

SECOND DIVISION.

Works to be Executed without Prescribed Designs.

Class 20.—Modelling.
Class 21.—Wood Carving.

Except in Classes 1, 2, and 4, the subjects will remain as in the list already issued; but in Classes 1, 2, and 4, other subjects will be given, particulars of which will be duly announced.

Proceedings of the Society.

Eighteenth Ordinary Meeting.

Wednesday, April 11th, 1866; William Hawes, Esq., F.G.S., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Brinsmead, John, 4, Wigmore-street, W.
Ellis, Charles Nicholson, 9, Tredegar-square, Bow, E.
Glover, George, Ranelagh-road, Pimlico, S.W.
Glover, George Raleigh, Ranelagh-road, Pimlico, S.W.
Head, John, Mill-street, Kidderminster.
Holdich, William, 105, Fleet-street, E.C.
Niemann, E. J., 19, Charlotte-street, Bedford-sq., W.C.
Pim, Jonathan, 22, William-street, Dublin.
Templeton, James, 7, Woodside-crescent, Glasgow.
Wilson, John C., 5, Lime-street, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Alison, A., 41, York-terrace, Regent's-park, N.W.
Bush, William John, 30, Liverpool-street, E.C.
Davis, E. J., Globe Wharf, Mile-end, E.
Fentum, Martin, 85, New Bond-street, W.

The Paper read was—

ON THE PIRACY OF TRADE MARKS.

By E. M. Underdown, Esq., Barrister-at-Law.

I have been requested to read a paper upon the subject of "Trade Marks" to the members of the Society of Arts, and I imagine that the Society is discharging one of its most important functions in investigating any mode by which the legitimate development of skilled industry is encouraged, and the public protected from the results of that lawless competition of unprincipled traders and manufacturers which, like a parasitical growth of weeds, at once destroys the fruits of honest industry and skill, and substitutes for them the noxious and useless produce of fraud and deceit.

A French writer* has well remarked that "Side by side with the development of industry, and with the place which it takes daily in the elements of general prosperity, a guilty speculation is seen to develop itself simultaneously, multifarious in the means it employs, and varied as are the contrivances of bad faith, but one and identical in its object, which is that of gathering the fruits of the labours of others. Jurisprudence, at first hesitating and uncertain as to enterprises of this novel species of piracy, has become gradually bolder as the progress of the evil manifested itself." A French motto well expresses the trader's true rights and responsibilities—"*A chacun les bénéfices et la responsabilité de ses ouvrages*," and it is of the highest importance, before proceeding further with the subject, that both lawyers and laymen should understand that the old principle of the law, "*caveat emptor*," is, in modern times, almost wholly inapplicable. How can the buyer of drugs, of cutlery, guns, metals, lime juice, potted meats, ground coffe[e,] sugar, flour, bread, bottled ale, judge of either adulter[a]tion or genuineness? When the sick man is dead, t[he] hunter's arm blown off, the scurvied sailor committed [to] the waves, the arctic voyager starved—is it then to [be] said, "*caveat emptor*," the buyer should have kno[wn] better? No one seriously can contend for this. W[e] know that in many cases it has for ages been fou[nd] useless to adhere to this one-sided maxim; that t[he] precious metals, weights and measures, proof of fi[re]arms, and other matters considered of public importan[ce] have been required to be marked in a manner set out [by] the legislature, and the observance of these formalit[ies] enforced by legislative sanction.

From what then arises the great indisposition to m[ake] the marking of merchandise obedient to such laws [as] may secure to the *trader* the reputation of his skill [and] honesty, and to the *purchaser* the power of enforcing [the] fulfilment of that responsibility undertaken by the offer[er] of the goods and the acceptance of the price,—in sho[rt,] that *warranty* which the English law is so chary of enfo[rc]ing? My friend Mr. Roberton Blaine, to whom I [am] exceedingly indebted for suggestions, has remarked to [me] what indeed had forced itself upon me in formerly stu[dy]ing the Roman jurisprudence, that our system of law be[ing] founded upon custom, and that custom the custom [of] barbarous nations, admirable as it is and always has b[een] for the preservation of personal liberty, is, in what rel[ates] to commercial matters, even now of the rudest desc[rip]tion, and accommodates itself to the complicated requ[ire]ments of modern commerce with far greater diffic[ulty] than the law of France, which having for its basis [the] highly organised law of the Romans,—has again b[een] codified under the circumstances and with the experi[ence] of modern times, and is governed throughout by log[ical] principles, expressed with a clearness to which unfo[rtu]nately our legal diction is a stranger. Not for a mom[ent] would I yield any of our great legal principles in wh[ich] the French law is wholly wanting, but in modern l[aw] making, as in the case of company and partnership [law] we have with infinite advantage borrowed much f[rom] their legists, and when we shall have availed ourselv[es of] their experience and remodelled the law with regar[d to] commercial frauds and the principles which ough[t to] govern commercial contracts, we shall have made a g[reat] step

I shall endeavour to show this, knowing that the "m[ark]ing of merchandise," in other words the "trade mark," [its] protection, and the responsibilities its use does and o[ught] to involve, will go far to rescue our commercial sy[stem] from the abyss of fraud into which it has fallen[, as] well as to protect the public from those injuries w[hich] the present condition of the law (although lately m[uch] improved) so imperfectly provides against.

It will be necessary for us to inquire:—

1. What is a trade mark; who should use it; w[hat] purposes it does and should serve; what property ma[y be] had in it, and what is the value of that property?

2. Should its application be compulsory or permissive?

3. What piracies are committed; for what purposes, and with what results to the proprietors and the public?

4. How is the trade mark protected:—by the comm[on] law of the country; by statute law; by the decision [of] the Court of Chancery?

5. Should it be registered:—if so, in what way; ho[w] should existing rights be protected?

The accurate definition of a *Trade Mark* properly so called, is of the highest importance to the due understand[ing] the subject and its difficulties.

It is, then, any mark, name, figure, letter, or devic[e] employed to denote that any article of trade, manu[]facture, or merchandize, is of the manufacture, work[]manship, production, or merchandize, of the person using it with or upon his goods. It must be the[re] only for the purposes of trade. It may be placed upo[n] the goods by any person whose "merchandise" they may be said to be, *i.e.*, the maker may use his mark

* M. Rendu, "La Concurrence déloyale."

the wholesale dealer his, and the retail dealer his, as long as such use of each is confined to the securing by some outward symbol what the French call *Achalandage*, and we, less accurately, "custom," that is, the mutual relation of trader and customer, established on the one hand by the supply of good articles, and on the other by the satisfaction of being well served, and does not convey or seek to convey any false representation. And here it must not be forgotten that there is no monopoly in the strict sense of the word. A monopoly is the giving to one person, either by statute or royal grant, a privilege solely to use or profit by that which by the general law should be the right of all; for instance, in the time of Elizabeth, the Earl of Essex's monopoly of the sale of sweet wines; the assaying and stamping of metals to the Goldsmiths' Company; the right, for the encouragement of inventors and men of letters and genius, to the profits, for a certain time, of inventions, books and works of art, given by letters patent and the copyright Acts.

But the use of a trade mark is no monopoly, any more than my name is a monopoly, because no other man has a right to assume it for the purpose of persuading the world that he is myself. A trade mark is to denote clearly who makes or sells the goods, and the use of such a mark by another is simply a lie and a fraud, and, as it has been before said, an attempt to reap the fruits which others have planted. This, strange to say, has hitherto been more protected than checked by our rulers in commercial matters.

It has been said, indeed, that the sole right to use a lion, or an eagle, is in some sort a monopoly; but then if the eagle is not the sole right of one person, of what use is it as a distinctive mark? It may, indeed, happen that several manufacturers have used an eagle, and by the common excellence of their manufacture, made it a mark which will sell their goods here and abroad. In that case, let them all use it; but I cannot help thinking that were there not some eagle which denoted a higher flight of excellence, other birds would not be anxious to deck themselves with the plumes; and we may safely leave it to time to show whether the real eagle will not be anxious to assert his independence. Designs or marks have been found preferable to names (though the latter may be trade marks), as being more conspicuous, and also from the fact that so many persons have like names.

The public, it may be thought, would be better protected were it made compulsory upon every man to place a mark denoting his manufacture upon his goods, and thus render himself responsible for their quality; but this argument is strongly combated not only upon the ground of convenience, but because in practice, if the mark is rendered permissive and, when adopted, well protected, it will be the interest of the honest trader by all means in his power to identify his own goods, and the public will be sufficiently secured by the principles of competition and self-interest. We thus come to the question as to the value of a trade mark, and we can all pretty well judge of that from the anxiety to adopt known symbols of great firms, but there is one value which known marks have, being more taking with uneducated persons and the natives of foreign countries than names, that is, their power of selling goods abroad and in the colonies, and it is there that frauds are practised to the greatest extent, some of which I shall presently point out. And here will be an appropriate place for me to mention that it is of equal importance to the consumer as to the trader, that the merchant or wholesale dealer should be encouraged to affix his trade mark to goods imported or exported by him, as an additional guarantee that they are what they profess to be, and that his known care in their selection and purchase gives his mark upon them a value intrinsically, which entitles him to the improved price the consumers will be ready to pay for such guarantee.

I shall have to call the attention of the Society to some remarkable facts which of themselves will show the enormous interest the public have in this question; for I cannot impress it too strongly upon the minds of members that the protection of trade marks is not a manufacturer's question solely, nor, when accurately examined, will it be found to be even primarily so.

The buyer wishes to obtain an article similar to other articles which, by his own experience and that of others, have been found of superior excellence; those articles, he knows, are marked with a cross, a pyramid, or a capital T, of well-known shape and colour; he buys the article so marked, and finds that it is inferior in quality, and that the sham mark was a puff. Here both are defrauded: the manufacturer, who has lost the sale of his goods for which he has obtained reputation; the buyer, who has got the wrong article. If the article is of equal goodness then the buyer may be said to be only deceived, but the manufacturer is defrauded. But how often will the latter happen? Does it not stand to reason that he who is dishonest as to the description, will be dishonest as to the quality? It is, I believe, a fact, that at least half the trade in manufactured articles is, to greater or less extent, fraudulent. To such an extent have the adulterations of food and even medicines been carried, that it may safely be said that it is practically impossible to obtain some varieties of them pure.

Flour, bread, sugar, sweetmeats, cocoa, coffee, tea, ales, gin, especially all the liquors sold at public-houses—wine—are all adulterated. Indeed one of the most prolific of the wine-growing countries is the free city of Hamburg, whence come, strangely enough, most of the sherries, ignorantly supposed to be the produce of Cadiz and Xeres; and the fine old crusted Oporto, whose only claim to the name it bears is that it is yielded by the most dishonest of all "Ports," which so well keeps up its right to have originated the word humbug. Drugs and medicines may also be included—two of the most wicked frauds with regard to which have been perpetrated lately—that of selling sham vaccine matter for use in the cattle plague, and another, which in atrocity can hardly be paralleled—the sale of sulphuric acid and other ingredients for lime juice for use on board ship, the only cure for that horrible disease, scurvy, which, unfortunately, from this and other causes, has lately increased to a frightful extent among our sailors.

Does not the law, which so imperfectly guards against these manifold evils, require speedy and effectual reform?

I was a few days ago informed by a gentleman of considerable experience in mercantile matters in Australia that the frauds upon a great brewery firm, in respect of their trade mark, decreased the demand for their ales in Australia to an enormous extent within a very short time. Purchasers asked for ales with their well-known brand, found that the ale did not correspond to the mark, and ceased to buy it. Here you have an instance of an almost national trade being destroyed; yet for years no steps were taken to protect the colonists and the merchants from such results.

[Several instances of piracies were here exhibited.]

I have in the first part of this paper adverted to the evils to be cured, and now I will explain shortly the mode in which they should be dealt with. It is a well-known saying that you cannot make men good by Acts of Parliament, and that vehicles of the most portentous size can be driven through such acts. Still, if we can but put the drag on this coach, containing so many outside and inside passengers of indifferent character, we may do some good, and ultimately, if we cannot get the vehicle off the road altogether, we may prevent it from so much injuring the trade of the regular stage; indeed, I believe the opinion is daily strengthening, that well-considered prohibitory codes are the proper modes of dealing with crime of all kinds. The Indian penal code, chiefly drawn up by Macaulay, is one, perhaps, of the quietest but greatest services rendered by that illustrious man to the subjects of this empire.

Astounding as it may appear to some of you, it has gravely been held by our courts that a false representation of quality is no false pretence. Thus I may not sell you iron for steel, or copper for gold, but—as in the case of R. v. Bryan—I may tell you that spoons are equal to Elkington's A, which are merely lead silvered over, for, *caveat emptor*—let the buyer beware!

Before the Merchandize Marks Act, 1862, no offence was committed by marking on goods false statements of their quantity, quality, measure or weight, and that Act for the first time makes a statement of quantity or quality upon an article a warranty.

It is true that with regard to the cutlery trade, several Acts have been passed, and trade marks have long been registered in Hallamshire with the best results. The same as to proof marks of fire-arms, and the assay marks on plate, which are a species of trade mark and warranty under penalty. With regard to hops, a series of Acts of Parliament have been passed to render compulsory the marking upon hop sacks certain particulars of "date, parish, weight, &c.," but since the duty has been taken off, the attention of the excise has not been so narrowly called to the trade, and some of the marks have fallen into disuse, while at the same time prodigious frauds are perpetrated by the sale of foreign and other hops for Kentish, and with the Kentish horse imitated upon the sacks.

I have here a bill on the subject, drawn by my friend, Mr. Edward Besley, of the common law bar, which has been introduced by Mr. Huddleston, M.P. for Canterbury, and the second reading of which will be moved by him on the 19th. Its provisions are more stringent than those of the Merchandise Marks Act as to compulsory marking, and necessarily so. I have had the advantage of some discussion with Mr. Huddleston on the matter, and I think that his success with that bill, strengthened as his case is by a long course of previous legislation, will help to establish the necessity of continued action of Parliament on the matter of the marking of merchandize. The frauds so committed are principally as to the district, age, and quality of the hops, and, as in the Merchandise Marks bill, some mode is sought to provide remedies without the enormous expenses of a suit for injunctions or for an ordinary prosecution.

To meet these and similar frauds, and generally to amend the law, the Merchandize Marks Act, 1862, entitled, "An Act to amend the law relating to the fraudulent marking of merchandize," drawn by Mr. Hindmarch, after some difficulty was passed. For that Act we are greatly indebted to Mr. Roebuck, Mr. Bass, Mr. Milner Gibson, Mr. Hadfield, and, for the preparing of a first Bill, to Mr. Travers Smith, the eminent solicitor, under whose instructions I have acted in drawing an amending Bill, which has been considered by Mr. Poland, and will, we trust be introduced shortly into the House of Commons.

The latter Bill purports to re-enact the former Act in its entirety—it having been thought better to avoid any charge of innovation, which, when directed against fraud, seems to be so dangerous in the eyes of the Legislature—also, the provisions of an Act to prevent the use of Exhibition medals as a means of deception; and, finally, it provides for the registration of trade marks, which was omitted from the former Bill, and which would, if properly managed, go a long way towards rendering the protection of trade marks, and the suppression of frauds of a cognate description, practically complete.

The provisions of the Act are directed:—

1. Against falsely applying trade marks to goods, and the articles containing them.
2. Selling goods with false trade marks so applied.
3. Altering trade marks.
4. Information as to where false marks are procured must be given.
5. Against marking and selling articles with false ndications of quantity, measure, or weight.
6. Sellers of articles are to be deemed to contract th the descriptions marked on them are true, and that t marks thereon are genuine.
7. Articles sold contrary to the Act may be destroy
8. All the civil rights of parties are preserved.
9. The most important provisions are those by whi redress can be obtained shortly and speedily, by way summary conviction before a magistrate; and this pr ciple it is desirable to carry to its full extent, for no le remedy for fraud can be effectual which is not ea speedy, and cheap.

Foreigners are protected equally with British subjec and here I would remark that, as far as the public concerned, this should be so, irrespective of reciproci for it little matters to me, if I am by a false trade ma induced to drink gooseberry instead of champagne, buy wooden nutmegs for real ones, whether there international reciprocity or not between this country France or America.

I will now give you a sketch of the decisions affecti this question. Trade marks have been known and u in this country and others from time immemorial, we must seek for the law affecting them in the de sions of the courts; for, as I shall show you, no gene statute deals with them until the Act of 1862, which is now proposed to enlarge and amend.

We find, in the time of Elizabeth (Popham's R ports, i. 43), that an action upon the case was broug in the Common Pleas by a clothier, that whereas he h gained great reputation for his making of his cloth, reason whereof he had great utterance to his benefit profit, and that he used to set his mark to his clo whereby it should be known to be his cloth, and anoth clothier perceiving it, used the same mark to his illm cloth, on purpose to deceive him; and it was resol that the action did well lie. In Croke, ii. 468, it however, stated that the action was brought by h who bought the cloth for this deceit, and h maintainable; so that it is doubtful by whom t action, in the opinion of the judges, should have be brought. The courts of law have there taken the vi as stated in "Comyn's Digest."

The judgments of the courts of equity have und gone several changes, but the course they have taken been gradually more and more in favour of the rec nition of the property in a trade mark.

Lord Hardwicke, in "Blanchard and Hill," refused injunction against the use of the mogul stamp on play cards. In "Mottley and Downman," Lord Cotten considers it necessary that the right at law should established before equity could interfere. Again, "Clark and Freeman," Sir James Clark was refused injunction to restrain Freeman from selling "Sir Ja Clark's consumptive pills," on the ground that S James did not sell pills, and was not injured in pecuniary sense. But some late cases, "The Leath Cloth Company *v.* The American Leather Cloth Co pany," which went to the House of Lords (33 *Law Journ* ch. 199; 34 ditto, ch. 53), distinctly place the grou of the courts' interference as property, besides establis ing important principles with regard to trade marks; in "Hall *v.* Barrows" (33 *Law Journal*, ch. 204), it w decided that a trade mark is property, and is proper valued as part of the partnership stock of the firm; th it does not descend to the representatives of a partn as such; and that the jurisdiction of the court in t protection of trade marks rests on property, and th fraud in the defendant is not necessary for the exerc of that jurisdiction. In "MacAndrew and Bassett" *Law Journal*, ch. 56), it was held that the name of foreign province (Anatolia) upon liquorice may be trade mark, though other persons might have pr cured the raw material from that province.

The essential qualities for constituting property a trade mark are—first, that the mark has not be copied, and involves no false representation; secondly that the article has become vendible in the market.

this case my friend, Mr. Dundas Gardiner, was engaged, as well as in several cases respecting the sale of spurious champagnes as the produce of the vineyards of the famous Veuve Clicquot, and I trust the Society may have the advantage of some remarks thereupon from him.

In "Seixo *v.* Provezende" (*Law Reports*, I., ch. 193), it was decided by Lord Cranworth, last November, that no trader can adopt a trade mark so resembling that of another trader that persons purchasing with ordinary caution are likely to be misled, though they would not be misled if they saw the two marks side by side; nor can a trader, even with some claim to the mark or name, adopt a trade mark which will cause his goods to bear the same name in the market as those of a rival trader.

"Ainsworth *v.* Walmsley" (*Law Reports*, I, ch. 519), was decided on the ground of absence of wilful misrepresentation on the part of the defendant, who had described certain thread as the manufacture of the plaintiff; it was also decided that the name of a manufacturer or a system of numbers adopted and used by him in order to designate goods of his make may be the subject of the same protection in equity as an ordinary trade mark.

In "Standish *v.* Whitwell," (*Times*, March 10,) which was a suit to restrain the infringement of the plaintiff's trade mark, an eagle upon iron, the defendants had innocently used the crest of an eagle upon iron manufactured by them. The injunction was granted, but without costs. Had registration existed, this suit would have been impossible. The defendants were not allowed to sell the iron so marked then remaining in their possession.

This matter is somewhat too technical for this paper, but will be found admirably discussed in Mr. Poland's edition of the "Merchandize Marks Act, 1862," published at the *Law Times* office, and in an equally valuable little treatise by Mr. Edward Lloyd, of Lincoln's-inn, explaining the subject from the equitable point of view, published at the *Solicitors' Journal* office, 59, Carey-street. Both authors complain that the difficulties of proving a fraudulent intention, and at law actual damage, deprive the Act of many of its advantages. It is hoped that the scheme of registration will render process for infringement of trade marks more easy and effectual, and I will endeavour to show how the scheme for registration, proposed in the Consolidation Bill which I have prepared, will tend towards so desirable an end.

Registration in itself is but one mode of creating and rendering public the evidence of title to any subject of property. It is a declaration of title, which, being uncontradicted by the world, is *primâ facie* evidence that the claim to the property is well founded. It should, therefore, be public and notorious, certain, deliberate, giving time to all persons to protest against its being made evidence against their rights. It should be accessible. It should be all found together so as to prevent simultaneous entries at different places, or the excuse of the wrong doer, that he only sought in one place while the entry was in another. It should be in hands above suspicion, and under the control of Government. It should be cheap and afford every facility for the decision of disputes and differences. And I wish to impress upon the Society the difference in point of principle, which I consider to be in favour of the registration of trade marks, as compared with other registrations.

Mortgages are registered in London and York to prevent people lending money on bad security. Bills of sale equally so. Ships, because from their nature it is advisable to give as much publicity as possible to their ownership. Land, to prevent disputes, and give a title from a fixed period. Books and copyright, for a similar purpose, to give evidence of a claim against the public for so many years.

But the essence of trade marks is publicity; the trader says to all the world:—Instead of writing my name, this is my ensign—my escutcheon. I value my individuality, and I inscribe it upon a public record, and claim the protection of the law for its use. Again, all persons willing to use trade marks lawfully have a right—as a penalty is attached to using one that is the property of another—to know if the mark they purpose to use has previously been adopted; and to all persons willing unlawfully to use the trade mark of others publicity is a warning, which, if they disregard, the mere act itself subjects them to a penalty. The public, moreover, will know that all honest traders will wish to identify themselves, and will look for the trade mark—will see if it purports to be registered—knowing that the false index of that fact is in itself a matter for the law to punish. The retail dealer now held to warrant that the mark is genuine, will at a glance see where and how he can verify the fact, and if he wilfully or negligently omit to take reasonable precaution, he will rightly be subjected to a forfeiture.

The English purchaser will know that foreigners, lawfully using a mark abroad, can register it here, and claim protection for it, which in its turn protects him, the buyer, as he knows that another provision prevents the importation of goods with forged marks.

Our Government has experienced considerable difficulty in obtaining protection for English trade marks in foreign countries, some of which—Hamburgh, for instance—refuse reciprocity distinctly upon the ground that no registration of marks exists in this country; a letter from Mr. Layard to that effect was read to the committee of this Society by Mr. Coxon; and as regards other countries, the additional protection which will be given to their subjects under this Bill would form an argument for reciprocity, when, as it may be hoped, our Government will adopt and endeavour to carry out some well considered scheme of international commercial relations with foreign countries, more especially those where at present our manufacturers are subject to most barefaced and extensive frauds. I may instance German and Dutch piracies of thread, needles, beer, cutlery, &c.; and, indeed, until our system has assumed a more definite form, and more clearly defined methods for the assertion and recognition of title, it is difficult to negotiate with foreign countries for substantial reciprocity of protection under their laws.

But the great use of the registration is to make the using of another's trade mark, duly registered, an offence. This is susceptible of the very easiest proof, and conviction will speedily follow; and these convictions are more dreaded by the dishonest trader than the most formidable chancery suit or action, which indeed are sometimes made advertisements of, and fail to effect any other object.

In providing a scheme of registration I have been careful to introduce as few novelties as possible. The registration of designs, of photographs, &c., has answered perfectly as a system of registration. The registry at Stationer's Hall enables any one among the millions of entries of books, &c., to be found in a few minutes. The Registry of Designs might with great advantage be made the foundation of the registry of trade marks. The machinery is ready and only requires extension. I have consulted with Captain Robertson, the registrar, and with Mr. Bowen, his able deputy, and there would appear to be no difficulty in establishing the system.. Thus no new office would be created.

The mode of registration is laid down in the Bill, subject to alteration and to the directions of the Board of Trade as to fees, &c., &c.

The question of district registries has been considered, and they, I think, will be found unadvisable. The requisite documents can be sent by post to London, and the registry must be central, or it will lose its most important feature, that of being notice to all the world.

The classification of the kinds of merchandise is the most important part of the registrar's duties; if this is once well done, the marks will be clearly and accessibly ranked under each class. What their classes shall be, and what their subdivisions, will be a matter of detail not inserted in the Bill, but published in the Regulations which I pro-

pose shall be issued by the Office. The mode of classification might be under Roman letters up to 26, then italic letters, then old English, &c., and the entry numerically under each, so that if it be desired to cause them to be attached to the trade mark, the affix would be short and simple $\frac{B}{24}$ $\frac{N}{46}$ and so on. The registrar of designs has adopted a most neat and ingenious method of marking upon the design or article the date, &c., of registry. A few words explanatory of the system of registration which I have marked out in the Bill, and I will leave the subject in the hands of the meeting.

The mode of determining whether a mark shall be placed on the register is simple enough. First, the registrar has to see if the mark is so like another that he may refuse to entertain the application; and this I peculiarly insist upon—the registrar must not be a mere machine. Against this the party may appeal. The registrar, if he receives the application, advertises it in the *Gazette* and such public paper or papers as are named in the regulations. Three months are given to objectors, who come in at a time and place. The registrar hears and decides. His decision, however, is not conclusive, and the parties may go to the courts and try their rights by appeal from his decision. The order of the court will then direct the registrar to make the entry, or the opposition being withdrawn, the registrar may enter. An entry can be expunged or varied by order of the Court of Chancery or a superior court of law. The unlawfully procuring a mark to be registered is made an offence. Using words or letters falsely denoting a trade mark which has not been registered to be a registered trade mark, is made an offence, and this, and the penalty against unlawful registration, I hold to be the great safeguards of the addition to the Act; for these reasons a trade mark without sign of registration will be *primâ facie* of little value, as, although property in it will not thereby be lost, yet, until it be registered, no suit can be instituted for its infringement, and no penalty exacted for offences committed in using it by the owner of it. The remedies of third parties will remain intact. No excuse will be left to the pirate, and detection will speedily follow upon transmission of the forged mark to the real proprietor, whose address and description will be found in the register under the letter and number denoted on the mark.

But again, the great point is, that the falsification will be directly and speedily punishable, being capable of immediate and direct proof. It has been thought advisable, in order to clear the register, and provide for lapsed and disused trade marks, that re-registration may be called for by the Board of Trade at intervals of some years—say ten or fifteen. Clauses respecting the abandonment and surrender of trade marks will be introduced in committee. Foreigners may, of course, register their marks here, but, to avoid fraud, and not to imitate the bad example of the French, who allow registration in their country to override the rights of proprietors of English trade marks in France, if the mark has been used abroad, the party applying will have to show that he has complied with the proper formalities at what may called the "domicile of the trade mark," *i.e.*, the place of business where its use arises, and whence the goods purport to issue. A section of the Act defines what is possession of marks, and power to search for goods fraudulently marked, and false trade marks, in certain cases, should, I think, be given, though the feeling of the Legislature is against it.

In conclusion, the efforts which have been made in the direction of improving the system should be known. Mr. Johnson, of Castle-street, Holborn, to whose son, Mr. Edmund Johnson, I am indebted for much kind assistance, appears for many years to have devoted much time and labour to the subject. I find that, in 1848, a society was in existence for the mutual protection of manufacturers from the fraudulent imitation of their names, manufactures, and trade marks, with Messrs. Vallance and Vallance as solicitors, who have, up to this time, shown great energy on the subject. Mr. Arthur Ryland, of Birmingham, has for many years been actively interested in the subject, and an association with similar objects was started in Birmingham last year, and action has been taken in large manufacturing towns, but the subject never seems to have been dealt with in a sufficiently comprehensive manner, except by the Select Committee of 1862, who postponed registration until it should be seen how the act operated. In 1859, Mr. Leone Levi read a paper to this Society, which fell into my hands after the completion of my own. The remarks of Sir Richard Bethell, who took the chair on that occasion were very valuable, and in his subsequent position of Lord Chancellor he has given effect to his then expressed opinions. The Society of Arts took part with the Committee of Medal Holders for the Exhibitions of 18[illegible] and 1862 (the honorary secretary to which was Mr. E. Johnson), of which the Medals Act was the result, prepared by myself and Mr. Poland, under the instructions of Mr. Travers Smith, but which was considerably altered by the Government before passing, and which it will be now sought in committee to amend as consolidated with the Bill I have before referred to. This Bill has also been recently deliberated upon by the Trade Marks Committee of this Society, whose suggestions have been most valuable, and who joined in a deputation of the Chambers of Commerce to Mr. Milner Gibson, President of the Board of Trade, who expressed himself favourable to the consideration of a measure with the object of providing a system of registration of trade marks, after hearing the remarks of the Chairman of the Sheffield Chamber. All I have to do then is to urge the necessity of united action to press upon the Government and the House the great necessity for this measure, and generally to use every effort to ameliorate the state of the law upon the great question of commercial fraud. I thank the Society for the honour it has done me in allowing me to read this paper.

DISCUSSION.

Mr. Edmund Johnson said, allusion having been made in the paper to the committee appointed by the Council of this Society to take action in this matter, he thought he might venture, having been in communication with a large number of the manufacturers of the country, to express their obligations to this Society for the hearty manner in which they had taken up the question. Notwithstanding the efforts made in various parts of the country for many years past, very little was done on the subject till the Parliamentary Committee was appointed, the result of which was the Act of 1862, which, although it had effected much, was incomplete. The present committee was composed of gentlemen representing different interests throughout the country, who were well acquainted with the subject, and who met here upon neutral ground, each stating his own grievance; the matter was then put into the hands of legal advisers to point out in what manner those grievances could be best redressed. The Bill to which Mr. Underdown had referred had been considered by the committee, by whom it was brought under the notice of the President of the Board of Trade; and when the Government had got through a few of the more important questions they had now on hand, it was hoped they might be induced to undertake to carry this bill through Parliament. The measure was most important as affecting the interests of our foreign trade; for the first essential step towards getting for our manufacturers that protection abroad which was required was, that the question should be placed on a proper footing in this country. When this had been effected, the next step would be to do something towards international protection in reference to trade marks, and he had no doubt that this would be a matter of considerable difficulty and labour,

but if the committee succeeded in their objects, they would not regret the time and trouble they had given to the subject. The present mode of registration was most imperfect, being nothing more than the entry of a trade mark at Stationers' Hall, like the entry of the title of a book, by which it was merely secured under the form of the copyright of a book. The specimens of fraudulent imitations of labels brought before them by Mr. Underdown this evening were very numerous, but they were small in number compared with what might have been brought together if it had been thought desirable. Manufacturers complained that not only were their trade marks copied in foreign countries, but their business was damaged through those imitations of trade marks being attached to articles of inferior quality. One remarkable case he would mention:—A manufacturer of needles sent his goods into the foreign market; a German manufacturer made a *fac-simile* of the English manufacturer's label, and sent his own inferior goods into the market so marked, thus damaging the Englishman's reputation. Complaints were naturally made as to the quality of the article, when the reply was:—"We have good German needles which we can sell at the same price;" consequently the trade of the English manufacturer was destroyed, and the foreign manufacturer by these means built up a business for himself. This showed that the trade mark of the English manufacturer was of little value unless it was protected in the foreign markets. He felt that the great remedy for the existing evils was a proper system of registration.

Mr. Thos. Webster, Q.C., was sure they must all feel extremely indebted to Mr. Underdown for this most interesting paper. He entirely concurred with that gentleman as to the necessity for registration; and he was astonished that the Parliamentary Committee should have left that question undecided, because he looked to the registration of trade marks proper as the very foundation of the title to property in them. It was truly stated that this was a question of property. In the progress of civilization we came to recognise property in various things which were not so regarded at the time when the laws now in existence were framed; and in proportion as the objects of property were multiplied, so there must be advances made in the legislation for the protection of that property. Property was an empty name unless it was protected by the law; and if they recognized property in a thing that was not regarded as property before, they must not be surprised if the remedies which the old law gave were not applicable to the new property that had been created. Hence the difficulties which had arisen in the protection of copyright and things of that sort, which might be regarded as incorporeal hereditaments. Property in a trade mark was essentially a copyright, and he did not see any objection, except in point of form, to treating it as a copyright. If a man adopted a distinctive emblem, it was essentially a design, and might come within the definition of a picture in the copyright act. For all such things registration was essential, as being the evidence of title. It was the means by which the public could be informed as to the person who had first devised the emblem, and his claim of property in it. Property in a name was a different thing. A person might have respect for his name and character as a manufacturer, and he might have property in his name without registration. He thought in that particular a clear distinction was to be drawn. A man had no right to adopt another person's name; it was as much a fraud for other persons to use the name of the original producer in connection with a particular article as it was to adopt a trade mark which had been registered. There was a property in the name, and if another person adopted that name it was a fraud which should be dealt with by indictment, and not by action at law, because it was a fraud whereby the public were deceived. He thought there was another matter which was rather mixed up with this question, that was, misrepresentation with regard to the quality of an article. It was said that a person's name or trade mark was a guarantee of quality. It might be so, and so long as the person remained as honest as he was at first, it was so. But the same man might make inferior articles. That was a distinct class of offence, the selling of goods not up to sample. They had thus three distinct things—property in a trade mark, property in a name, and warranty; and he thought the misrepresentation of articles, either as to quality or quantity, should be a criminal offence rather than the subject of a civil action. In the case of Farina and Silverlock, the excessive expense of those suits in equity had been shown, and this was most unfair upon the injured party. Reverting to the question of the registration of trade marks, it was required not only for the purpose of establishing the title, but a person who wished to design a trade mark of his own ought to have the opportunity of seeing what had been done before,—just as in the case of an invention he could examine the specifications of previous patents. The present law being inadequate, the great objects to be sought for were a proper record of the property in trade marks, and proper remedies in cases of infraction of the rights of that property.

Mr. Coxon remarked that a name was often an inadequate protection. There might be two persons of the same name who sold the same kind of article. The reason why Messrs. Bass adopted a trade mark was from fear that there might be another Bass, and they wanted some distinctive symbol which would represent their own article beyond doubt, and which another man had no legal right to use. If another person's name was "Bass," he could not be prevented from calling his ale "Bass's Ale," but he could be prevented from using the pyramid as a trade mark. He was happy to find that there was no difference of opinion as to the necessity for registration; the only thing to be decided was the best way of carrying it out. His own feeling was that an effort should be made to induce the government to take up this question. He believed it would be a very difficult matter for an individual member of the House to carry through such a bill as Mr. Underdown had mentioned without the assistance of the ministry. He had been told by an old member of Parliament that the bill was too long by half to be carried by any single member, and that unless they could get the government to take it in hand, it must be very much curtailed.

Mr. Webster explained that he did not say a name was sufficient, but if a person chose to use his name, and he thought it sufficient, there was no reason why he should be compelled to register it. If another person adopted the same name in connection with a similar article it was a fraud.

Mr. Campin thought registration was the only way of giving a ready means of protecting trade marks. A resort to a criminal prosecution was by some thought necessary to give it efficiency; but care should be taken not to make the proceedings too cumbrous. The Act of 1862 gave a remedy by indictment, a proceeding which many persons would be disinclined to follow. For his own part he preferred the simple procedure provided by the Designs Act, which he thought would equally apply to the fraudulent use of registered trade marks.

Mr. Galloway remarked, that the exhibition of fraudulent imitations of the labels of celebrated manufacturers which they had witnessed this evening, was sufficient to show that a radical change in the law on this subject was called for. He could conceive nothing more flagrantly wicked and disgraceful than such attempts to defraud the public and cheat the manufacturer. It was a direct felony upon manufacturers to issue such labels as those, and send them forth as genuine. Such a proceeding was a disgrace to our boasted character for commercial integrity. Desperate cases called for desperate remedies, but the great question was how these were to be applied. For his own part, he would visit the offenders in those cases with

condign punishment, and he would have the names of every man and firm who were guilty of such flagrant conduct published to the world, which he believed would have great effect in putting a stop to such disgraceful practices.

Mr. Robertson Blaine said, from the very admirable paper they had heard, and from the observations that had fallen from his friend Mr. Webster and other speakers, they must all be convinced of the great importance of something being done really to assist manufacturers and the public to put down this disgraceful state of things with regard to these imitations of trade-marks. He thought the last speaker had not too emphatically denounced so iniquitous a practice. It was a scandal upon the country. In reference to the legal remedies in such cases it was deplorable that a man should be put to the enormous expenses which the present state of the law required in protecting that which was his own property, viz., his trade-mark, for the courts of equity had long recognized the protection which trade-marks were entitled to. The subject had been taken up by the legislature, and proprietors of trade-marks had been largely assisted by the provisions of the Act of 1862. At that time the subject of registration was considered by a select committee, and, he thought, mainly, perhaps, in deference to the opinion of an esteemed member of the bar, Mr. Hindmarch, who spoke strongly against registration, it was thought advisable to defer it; the consequence was the Act of 1862 was passed without making registration a part of it. Now, in the year 1866, they found that the Act, as far as it went, worked very well. By that Act summary remedy was given before a magistrate in certain cases, but that was not always satisfactory. The great object of registration was really this:—It was known that in every case brought into a court, either of equity or law, they must bring their witnesses time after time to prove the right to the exclusive use of a trade-mark; and to obviate that great trouble and expense was the main object of registration. It was essential that the registrar should have the power to determine who was entitled to register, and what mark he might adopt. It should not be done in the loose manner now in use under the Copyright Act; but the registrar must see what he was about before he placed any name upon the register; and when, as under the Registration of Designs Act, he saw his way to register, he would give a certificate of registration, which in courts of law would be *primâ facie* evidence of title. Moreover, with our enormous foreign trade, it was of the highest importance that not only should we have everything, as far as possible, right at home, but we should be able to obtain protection abroad, and this would be mainly assisted by the legislation now proposed; because, as had been said, the free town of Hamburgh did not recognize our trade marks simply because there was no registration of them here. If we had a proper system of registration it would enable our Government to obtain reciprocal protection in other countries.

Mr. Dundas Gardiner said allusion having been made to him in the paper, he would briefly state his own experience with reference to foreign trade marks. Those who drank champagne, of course, wished to have that wine in as pure a state as they could get it. He would inform the meeting that, in the beginning of the year 1863, he was engaged in seventeen cases, in which M. Cliquot, and M. Moët, two of the greatest champagne growers, took proceedings against parties for selling spurious imitations of their wines with fraudulent trade-marks; the difficulty in those cases was to trace out the persons by whom the wine was sold, for it was generally taken out of bond in small quantities, and the holders were with difficulty discovered. In such a case as that, registration of trade-marks would give but slight protection, because the parties gave a sample of the genuine wine, while a spurious article was afterwards sent to the customer. He thought he could understand how it was that the registration of trade-marks had been so long postponed. He believed it was owing to the fact that up to a recent period the law courts were divided in opinion as to whether or not there was any property in them. According to the decisions already given, it would appear that if, for instance, a person sold a particular quality of rum with the figure of an eagle as a trade-mark on the bottles, any other person was at liberty to use the same device for gin, and there were no means of restraining the sale of that gin as "eagle gin." The property was therefore not in the device, but in its application to a particular article, and he thought this might, to some extent, explain why the system of registration had not been adopted; but with the adoption of that system he believed a great many of the cases of fraud cited by the author of the paper would be quietly done away with. The great point then would be to make the registration as publicly known as possible, in order that people might be aware who were the owners of any particular device which had been adopted as a trade-mark.

Mr. Henry Maudslay, having expressed the interest with which he had listened to the paper, remarked that he feared there were many cases in which frauds were practised which would not be remedied by the introduction of the system of registration of trade marks. As, for instance, dishonest persons might become possessed of a large number of Farina's old bottles still having the genuine label upon them, and these might be refilled with a spurious article and sold to the public as genuine. The same observation applied to all mineral waters and other things of that kind. Coming to the question of the exclusive use of a name, he could say that though he might be supposed to have some respect for his own name, its use did not always protect him from fraud. It might happen that a piece of machinery was required to be sent out to Australia; it might be ordered through the agency of other persons, to whom it would be sent from the works, with the full name of the firm upon it, as a guarantee of the excellence of the material and workmanship. The agent might then remove the name of the manufacturers from the machine and put on a brass plate with his own name upon it in place of this. What remedy had he in such a case? What was the value of the "name" then?

Mr. Underdown said this was punishable under the Merchandize Marks Act.

Mr. Hunt said a case similar to that just mentioned occurred in the firm with which he was connected, in which a customer brought to them some goods bearing the label of the firm, and which had been purchased as being their manufacture. He at once perceived that the article was not their manufacture, and he afterwards found on the reverse side a label which was not that of his firm. By inquiries he was enabled to discover who the party was, and the matter was put into the hands of a solicitor. Although, under the Merchandise Marks Act, the person might have been proceeded against for a misdemeanor, the firm accepted a written apology from the offender, with liberty to publish it as they thought proper. He could confirm the remark of Mr. Underdown, that such a case as Mr. Maudslay had mentioned might be dealt with under the Act of 1862. With regard to the observations of Mr. Webster as to the punishment of manufacturers who had adopted a trade-mark, and afterwards sent out an article inferior to that on which this mark had been originally affixed, with the experience he had had in business, he could not conceive it possible that a manufacturer of reputation would thus lower thequality of his goods, an act which would result in complete loss of character.

Mr. Daniel, Q.C., said reference having been made to his old client M. Farina, he would add that Mr. Underdown had not half done justice to the misery and anxiety which the English law inflicted on M. Farina in that case. The action was brought against the printer for the imitation of the label; having passed

safely through the Vice-Chancellor's Court, he had hoped to do the same before the Lord Chancellor, but the question was raised that an imitation was not a *fac-simile*, although it was so close an imitation that the difference could hardly be discovered without a microscope. The excuse was that M. Farina's label got rubbed off, and honest people wanted to replace an honest label, therefore a printer printed, not a *fac-simile*, but a colourable imitation, which it required the greatest skill to discover. Looking at the numerous imitations exhibited of Bass's labels, he almost wondered that the existence of such a man as Bass was not doubted. People had doubted whether such a man as Farina ever lived, and would have continued to do so, had he not appeared bodily in court on this occasion. The question seemed to him so plain and simple that the difficulty was to understand why the true remedy had not been found earlier—viz., registration. Nothing human was perfect, and there might be cases to which registration would not in every particular apply with certainty. Cunning and fraud might defeat the law in certain cases, but these were exceptional; in 99 out of every 100 he believed registration would be a sufficient remedy. With regard to the question of property in trade-marks, he thought his learned friend had hardly done justice to the Court of Chancery in reference to the question of property. Lord Cottenham, in the case mentioned, established as a principle of law that there was property in trade-marks, when he held that an individual who innocently and unknowingly adopted a mark which belonged to another man could not continue to use it. That principle had been followed up by Lord Westbury, when he held that if a man had a particular emblem by which he denoted the results of his own labour, the law protected him in the exclusive use of that emblem, and to that extent it became a property. His learned friend (Mr. Gardiner) had said, if he put the figure of an eagle as a mark upon rum, he could not prevent another person putting the same mark upon gin. So if a man took a stall at the opera with the right to use it on certain nights, it was his property during the time he had bargained for it, but at no other time. He believed the remedy was in a proper system of registration.

The Chairman said before asking the meeting to accord their thanks to Mr. Underdown for his very excellent paper, he would offer one or two observations upon it. In the consideration of this question they must keep in view the difference between the rights of the trader and the benefit of the public. He questioned whether the protection of trade marks would really do much to prevent fraud upon the public. It would prevent fraud in a particular way, but to suppose that the registration of trade marks would secure that none but pure medicines should be sold, or nothing but pure beer brewed, was a fallacy. What they wanted was a public registration of trade marks, and that for anyone using them who had no right to do so there should be a summary and certain punishment which could be inflicted with the least expense to the persons whose rights were invaded, and in such a public manner as should brand the offender with the character of a fraudulent trader. Moreover, the penalties should not be made so severe as to excite commiseration. As to the question of property in trade marks, it was impossible to conceive that any man who had achieved a reputation for a particular commodity, and marked it with his device, had no property in such a device. There was another point in connection with this subject which had not been touched upon, for it appeared to him that if this question of trade marks were properly settled, it would in a great measure assist in the settlement of the question of patent right. One of the great evils they had had to contend with in all the questions relating to the patent laws, was the enormous number of patents which had been taken out for trifling things, and which impeded the progress of true invention and improvement. If all minor matters could be taken out of the patent law and the property in them secured by the mere registration of trade marks, this would relieve the question from a great incubus, and even if the patent law was abolished the property in trade marks would remain, and would stand to some extent in substitution for it. With these few observations he would now ask the meeting to thank Mr. Underdown for his very interesting paper, to thank him for bringing this subject again so lucidly before this meeting, and to express a hope that the committee now sitting would not rest till they had found either some member of the government or some independent member who will bring this subject before the legislature, and persevere in carrying the bill.

Mr. Underdown, in acknowledging the compliment paid him, expressed the great pleasure which had been afforded him by the able manner in which this question had been discussed, especially at hearing from lawyers of such eminence who had taken part in the proceedings, that the *property* in trade marks and cognate subjects had finally been acknowledged and settled by the Court of Chancery and the House of Lords. All lawyers knew how that principle had been fought through every court —how gravely one decision after another had been given that there was no property in such things — and how the House of Lords had, in the case of the the Leather Cloth Company, decided that there was a distinct property in trade marks. If there was such a property established, the common law of England would come in to protect it. With regard to affording protection to the public, he thought this would be effected if the person who made goods could be induced in all cases, to put on them some mark which should identify him with the manufacture; that would be a protection as to the quality of the goods. As to the fraudulent adoption of names, he might instance the case of Messrs. Guinness, who had suffered much from the imitation of the *fac simile* of their signature on spurious stout. It had been difficult to establish this as a fraud, because it was not easy to prove that any one had been defrauded. It was not a forgery, the false pretence was almost impossible to prove, and he believed unless this could be proved no punishment could be applied. This would be rendered much more easy by a clause in the Bill. With regard to the difficulty of passing this bill through Parliament on account of its length, he would say that the Merchandize Marks Act, which was incorporated in this, contained twenty-four clauses, the Exhibition Medals Act two or three, and the whole bill contained only forty-three clauses, so that the additional provisions only required sixteen or seventeen clauses, which were not new in principle, and merely provided against the fraud referred to, gave the customs power of seizure, and set out the necessary formalities for registration.

Numerous specimens of fraudulent trade marks alluded to in the paper were shown, the genuine and spurious being exhibited side by side. There were upwards of thirty forgeries of Messrs. Bass's well-known labels, collected from most of the principal cities of Europe; a large number of similar imitations of the labels of Messrs. Tennent of Glasgow, forged in Havannah, New York, Trinidad, and elsewhere; of Messrs. Brook, Brothers, thread wrappers and labels, forged in Barmen, Augsbourg, &c.; also, those of Messrs. Walker, Evans, & Co., of Derby; name-plates used by Messrs. Broadwood and Sons on their pianos, forged in London; also, forgeries of Messrs. Rowland's Macassar Oil wrappers, and of those for Messrs. Farina's Eau de Cologne; of Messrs. Everett's blacking labels; of those used on Messrs. Atkinson's perfumery; on Messrs. Harrisons' mustard, and various other articles.

Proceedings of Institutions.

Haley-hill Working Men's College and Young Women's Institute.—The annual meeting and presentation of prizes to the students of these institutions took

place on Thursday evening, the 5th April, in All Souls' school-room. The principal, Col. Akroyd, M.P., presided. The attendance of students was very good. Mr. Gibb, the head master, read the annual report, from which it appeared that the Working Men's College maintained its prosperity and success as an institution, but the Young Women's Institute had been less successful. The Rev. Jonathan Jones, M.A., head master of the Guilsbrough Grammar School, was this year the examiner, and his report was also read, and upon the whole was satisfactory. Col. Akroyd then addressed the students, observing that their annual meeting seemed to be one of peculiar interest to Haley-hill. Occasionally they were favoured with the presence of visitors, sometimes the chief magistrate of the borough, yet, if this sort of stimulus were necessary, he should be afraid of the permanence of the institution. He had been anxious of late years that all the progress made by the institutions should be peculiarly the work of the students; that the impulse for advancement should come from within and not without; and indeed he was sure that unless the benefits of the college were ascertained and appreciated by the students themselves it would fail and cease to be supported. What was the conclusion to be drawn from the report? It was true that something was said about a falling-off in regard to the Young Women's Institute, but it must be remembered that there were other institutions of the kind in Halifax, and some of the members might have withdrawn to them. Again, it was difficult to understand how to adapt themselves to the various and varying tastes of young women of the present day. However, he was of opinion that there was no excuse for them to withdraw from that institution. With respect to the young men, upon whom would fall the battle of life, who would not only have to maintain themselves, but also wives and families—he looked to them as being the strength and support of the college; and he was delighted to find that with them there was no falling off, and that they kept up their attention and enthusiasm. He ascribed much of the success of the institution to Mr. Gibb, the head master. The prizes to the students were then presented by Col. Akroyd. Mr. Akroyd Ridgway next addressed the students, giving them some sound advice as to the prosecution of their studies. Thanks were voted to the examiner, the Rev. J. Jones, on the motion of the Rev. H. B. Hall, seconded by the Rev. Mr. Cox, head master of Heath Grammar Schoool, and was carried unanimously. The Rev. F. Musson next proposed a vote of thanks to the chairman. Mr. F. Baines, George-street, seconded the motion, which was carried with acclamation. The chairman responded.

RAILWAY REFORM.

In Messrs. Travers' circular for March 24th this subject (see *Journal*, p. 345) is continued as follows:—

The public complaints against the present system of administration are, as we have seen, mainly these:—(1) That there are unreasonable discrepancies between the passenger rates of different lines. (2) That there are still more incomprehensible discrepancies between the goods rates of the same line; and (3) That there is a gigantic disproportion alike in the goods and the passenger traffic, between the price charged to the public and the expense incurred by the companies. The simple fact which the reader has to bear in mind is that he has to pay 8s. 4d. for being carried 100 miles, over which he can be conveyed at a cost of 3½d. To this we may add the equally undeniable but still more astonishing fact, that a ton of coals could be brought from the extreme north of England to Shoreditch for something like 1s.; and as the cost there is 7s. at the most, we might have it in hand here at 8s. What we actually do pay for it is between three and four times that sum. Before proceeding to explain the plan which has been proposed for the removal of these anomalies, it may be as well to notice a most substantial grievance from which nearly every member of the shareholding portion of the community suffers more or less seriously—the ruinous cost of parliamentary proceedings. In old times the average cost of railways was £35,000 a mile; to-day it is only £12,000, or little more than a third; indeed, there is a line in Ireland which has been completed at the cost of £5,160 per mile. One consequence of this vastly increased facility of construction has been the rise of a new class of speculators, who have been justly called "the scourge of the railway interest." In the palmy days when frantically sanguine people anticipated 20 per cent. dividends, railway companies only contended with each other. Now, two or three individuals form a company, and "run up an opposition line with or without assistance from others, as the case may be; and when the line is finished they sell it, lease it, or work it in opposition to an old line till they can get their own price; and having cleared a small fortune by the transaction, they are off to 'fresh fields and pastures new' in search of some other enterprise." The tremendous contests entailed by these enterprising persons, as well as by established companies constantly struggling to extend their borders and "invade the territory," as the very cool phrase goes, of their neighbours, are sufficiently notorious. Hundreds of thousands of pounds are consumed every year in fees to committees and fees to parliamentary counsel, while whole armies of solicitors, agents, surveyors, and witnesses are maintained as it were at free quarters by contending associations. The effect of the private bill system upon dividends may be conjectured even by those who are happy enough to be ignorant of it in their personal experience. One of the most feasible plans for mitigating this outrageous and most vexatious expenditure is to abolish the existing private bill system altogether, and to substitute for it the presentation to parliament of a report upon railway bills, and all other public projects, by a council of paid examiners. Members of the legislature, unpaid and overwhelmed with other public and private business, cannot be expected to devote the laborious and sustained attention which is required for the investigation of the thousand schemes which now every spring seek parliamentary sanction. Before a paid, and so to speak, judicial council, no company hostile to the proposed project should be allowed to appear. The only opposition permissible would be that of the inhabitants of the district, who might appear by counsel or otherwise. If they could show that the project would, if carried out, actually inflict some injury on them, or in any way prove prejudicial to them, or contrary to the national interest, then plainly the report ought to be unfavourable. But except in this case it is hard to see why the requisite permission should be refused. The practice of such refusals, in order to protect an established company in its monopoly, is altogether out of harmony with the spirit of free enterprise which is encouraged in every other department of the national affairs. The unfettered movement of capital is the great principle of all legislation of this kind. It may be said that as railway projectors always want certain compulsory powers, they are not fairly to be compared with other enterprises. But if these compulsory powers were granted without just cause, it would be open, as we have said, to the inhabitants of the district or any one of them, to make out a case against the granting of such powers, either in gross or in some special item.

It may be said, again, by those who mistake ignorant or interested rumours for fact, that the original companies received a sort of understood moral guarantee that they should not be interfered with in their own districts. The truth is just the reverse. "Each company, in obtaining its Act, had it granted on the clear understanding that the legislature could and would permit whatever competing lines in the same district they might think necessary." It will be seen presently that there

can be no alternative ultimately between this unlimited competition and the scheme to which attention is now directed.

Let us hasten to explain, as briefly and clearly as may be, the precise nature and the true meaning of that plan, at first so startling, which is vaguely called the plan for the Government purchase of all the railways of the country. We shall reserve a consideration of its expediency for a third and final article. The most important thing, in the first place, is to get a thoroughly distinct notion of what the proposal really is, and of the benefits which its advocates promise that the public shall reap from its adoption. Persons ignorant of the subject, yet who have not on that account refrained from sneering at the proposal as the most preposterous that ever was broached, are disposed to think it a new-fangled novelty, sprung from the brain of a crotchetty dreamer. Let us remember that the conduct of the railway up to 1844, had been so monstrously bad that this plan was seriously brought before the legislature at that time, and that both Sir Robert Peel and Mr. Gladstone, then President of the Board of Trade, thought the plan in itself worthy of approval; but were in some doubt, or at least the former of these two distinguished statesmen was, as to the expediency of carrying it out before public opinion was fully ripe. The doctrine which startles so many people now was recognised distinctly in the Railway Act of 1844, and especially in the permissive clause, making Government purchase optional at the end of 21 years—an interval which is just now coming to a close. The proposal therefore can neither claim the merit, nor is guilty of the demerit, of being novel.

1st. What is meant by Government purchase? Not a payment of money by the Government to the railway proprietors, for as the value of railway stock *is* rather more than four hundred millions, this would plainly be impossible. Purchase from the shareholders "means the exchange of their shares for a certain amount of Government stock, the shareholders giving up their property, from which they receive a fluctuating dividend, and receiving in exchange a fixed annuity for a lesser amount *in perpetuity*." As the State is the best security, a given rate of interest from the State, being much more certain, represents a larger capital than the same rate from any ordinary investment. The income of stock is not the sole test of its value. "All shareholders," says Mr. Galt very justly, "would willingly accept a much lower rate than they now receive if it was secured by a Government guarantee, not merely by reason of the certainty of always getting that interest, but from the still more important considerations of the *security of capital*, and the higher price the stock would realize when sold." The question for the shareholders would be this:—What effect will the Government purchase have on the market price of my shares? or, how much more than the present price could I obtain by selling to the Government? Putting this in another way, what bonus would the Government give to induce them to sell? Let us take an example. In June, 1864, London and North Western Shares were quoted at 114. Suppose the Government offered a bonus of 15 per cent. on the price of this particular day; this would raise the price to £131. "Is there any shareholder in the London and North Western who would refuse £131 per share from a private individual, on the sole condition that he should not purchase back into the same company?" In the Act of 1844 there were two different modes of procedure. This was one. The other was to pay "a sum equal to twenty-five years' purchase of the annual divisible profits, estimated on an average of the three then next preceding years." This mode, however, of ascertaining the value of a railway would be open to a number of very fatal objections, the most obvious of which is that the dividend produced over a short period is no test of value. Again, a railway whose dividend had gone on increasing by 1 per cent. for each of the three years, would have its value estimated on a retrospective decrease, instead of on a prospective increase. And there are other arguments in the same direction not less conclusive.

2nd. How will the Government pay the bonus; or rather, how will the Government be able to procure the interest on the bonus? The average difference of interest between an investment in Government stock and one in railway stock may be put at £1 10s. per cent. In other words Government would make £1 10s. per cent. more by the railways than the rate of interest which it had to pay upon them. Rightly speaking its superior credit would enable it to borrow at 3 per cent. money out of which it could make 4½. The bonus would on the average be so fixed that one-half of this difference, 15s. namely, would pay the interest on the bonus, while the remaining 15s. would make up for the loss in reduced fares and charges; that is to say, "of the increase in the value of income derived from the conversion of railway shares into Government stock," the profit would be equally divided between the two parties; the shareholders and the public. Of course, the principle of the movement is that the State is to derive no revenue from the working of the railways. The means of communication and conveyance are supposed to be of such immense national importance, of such momentous concern to those of us who travel, to those of us who send and receive merchandise, and therefore, to all those also who are affected by the cost of transit of goods, that is to all consumers, that it must be inexpedient to make it an object of taxation. At present we pay upwards of thirty-one million pounds to the railway companies. It has been estimated that one immediate effect of the transfer of the railways from a number of profit-seeking associations to the nation, which of course would seek no profit out of its own pocket, would be to reduce the fares by two-thirds, that is, to relieve all travellers and all consumers of goods, in other words, the whole community, of what is to all intents and purposes a tax of no less than twenty odd millions of pounds.

3rd. What advantages would national ownership possess which would enable the Government thus to cheapen fares and freightage?

(*a.*) It would want to make no profit.
(*b.*) There would be no ruinous contests between rival companies.
(*c.*) At present, the railways of the United Kingdom are managed by some seventy or eighty independent companies. An immense sum, certainly not less than a couple of millions per annum, would be saved by amalgamation into a single system, because the management would be consolidated, and therefore cheapened.

4th. How would the Government actually set to work to effect this great change? "The terms for the different classes of shares having been settled by the legislature," says the writer to whom we have already referred, "and the day named for which the Stock Exchange quotations from the share list should be taken as the standard of prices, it would be announced by Government that on and after such a day all companies that chose to accept the Government terms would be dealt with. The legislature in the meantime having settled the tariff, both for passengers and goods, the Government would only require to make a temporary arrangement with the board of such company for carrying on the traffic until the bill of the companies came in. So soon as one of the great lines toward the north should signify its adhesion to the Government, and commence business on the Government tariff, it would encourage all the other companies having lines in the same direction to accept the Government terms, and thus the extension of the scheme throughout the kingdom would soon be accomplished."

5th. Does State ownership necessarily imply Governmental administration? No, for the management of

the railways might be conducted in one of three ways at least, none of them involving the objectionable characteristics of actual Government management. (1.) The country might be divided into convenient districts, a tariff having been settled by the legislature, and the working of the lines might be left to companies on the competitive principle, deriving their revenues "either from a certain percentage on the gross receipts, or a fixed sum per train per mile, as might be agreed on. This system, in fact, would resemble the familiar practice in the case of Turnpike Trusts. (2.) The tariff having been settled, the administration might be left to a Board of Commissioners, selected by the directors themselves, from their own directorates, and simply carrying out the laws enacted for their guidance, as is the case in the administration of the Customs and Excise departments. (3.) There might be a board similarly appointed and presided over by a Minister of the Crown, "who would be responsible to the legislature for the performance of his duty, that duty to consist in fully developing the traffic of the country, by adopting the best means advised by those who were most competent to do so," there being in the Board representatives acquainted with the requirements and resources of each respective district.

The objections to these schemes we shall consider in a final article, as well as the question of some middle course, which might secure the public some at least of the advantages we are promised from this more extreme and revolutionary measure. Meanwhile, it may be well to remind shareholders of what we said at the commencement. The principle of the Act of 1844 was declared br Sir Robert Peel to be a declaration to the companies, "You shall not have a permanent monopoly against the public." Hostility to monopoly has grown stronger every day since. Is it to the interest of the proprietors to allow unlimited competition (and this is what it must come to), to go on depreciating the value of their property? There are two courses open—sale to the Government, and such a reduction of tariff as will render competition futile.

Fine Arts.

Industrial Art in Paris.—The *Union Centrale*, of which mention has frequently been made in this journal, and the object of which is to do for France what the South Kensington Museum is doing so well here, is pursuing its course with great spirit. The lecture session commenced on the 9th of the present month of April, and lectures will be given three times a week during the session. It will give an idea of the ability called in aid of the society's efforts to mention that during the current month MM. Bauderon, Caffe, Rousseau, de Longpérier, and Guillaume, all members of the Institute of France, will address the young working men of Paris on architecture, sculpture, and painting; on sanitary questions connected with the artistic professions, on chemistry in relation to the industrial arts; on the teaching of drawing; and other subjects connected with art education. The library of the *Union Centrale* is growing rapidly in importance, and is open every evening from seven to ten o'clock.

Exhibition of French Historical Portraits.—It is proposed to hold an exhibition of portraits in Paris next year, during the time of the Great Industrial and Art Exhibition, in the Champ de Mars. "A large building is to be erected for the purpose," says the *Moniteur des Arts*, "in the avenue of the Champs Elysées." It is said that the proposal emanates from those who are in a position to carry out the object in the best manner, not only as regards art, but in a material point of view.

Bordeaux Art Exhibition.—This exhibition, one of the most important in the French provinces, opened in the last week in March. The number of pictures exceeds six hundred and thirty, and in the list of exhibiting artists are many well-known names:—Accard, Antigna, Fichel, Hébert, Jongkind, Landelle, Lays, Meissonier, Philippe Rousseau, Theodore Rousseau, and many others. Such exhibitions as these, taking place in all the principal towns of the empire, must have an immense effect, not only on the artistic education of the people, but also directly on art.

Manufactures.

Coating Cast Iron with Copper.—There has hitherto been a difficulty in accomplishing this. M. Oudry, about two years since, adopted a process which enabled him to give a conducting surface to iron, so as to permit copper being deposited by means of the electrotype; and this he effected by giving the iron several coats of a special paint, which was subsequently covered with plumbago. This, however, gave no direct adhesion of the coating to the iron. M. F. Weil has just invented a process, by which the layer of copper is deposited directly on the cast iron; it is stated to be very adhesive, and may be increased to any thickness by means of the electrotype process. He dissolves in a stoneware vessel* in four litres of water, 750 grammes of the salt known as Rochelle salt, and 400 grammes of caustic soda of commerce. He next dissolves 175 grammes of sulphate of copper in one litre of water. This solution is then poured into the first, producing a blue liquid, forming an alkaline copper bath, marking 19° Baumé, at a temperature of 20°. The iron to be operated upon must first be well cleaned by being immersed in a pickle composed of dilute sulphuric acid, of the strength of 2° Baumé.† At the end of ten minutes the articles are taken out and plunged in a feebly alkaline solution of caustic soda (1° Baumé). The next day the articles are withdrawn from the solution, and well scrubbed with an iron "scratch brush." They are then surrounded with zinc wire, and by means of it suspended in the alkaline copper solution described above. At the end of from about twenty four to forty eight hours—sometimes as much as sixty hours—the coppering will be found to have been completed. The articles are thoroughly washed in plain water, and will bear a hard polishing with a "scratch brush" of brass, without any particle of the deposit detaching itself.

Breech-loading Fire-arms in Russia.—The Russian Government have quite decided that the breech-loading system shall be adopted for small arms throughout the service. There are three government manufactories in Russia, producing in the aggregate 1000 rifles per week. The quality of the arms made is, in all respects, of the highest class. One kind of breech-loading rifles, made at the government factory near St. Petersburg, is that most in favour at the present time with the Russian Government, but they have not yet sufficient confidence to adopt it finally; further trials of other systems will be made before a decision is arrived at. The opening of the breech in this arm is effected in much the same way as in the Prussian needle-gun. It is fired with a cap. The escape of gas is prevented by a bullet placed at the back of the charge, which, under the force of the explosion, tightly fills up the back of the breech. After firing, the bullet is thrust forward by the succeeding cartridge, with some little assistance from an arrangement designed to effect the first movement of the bullet, and it then becomes the projectile. Good revolvers (pistols) are also made at the government establishment at Tula.

* Vessels of wood, covered with gutta percha, are equally available.

† The careful "pickling" of the iron is very important for the success of the operation; and the pickling bath found most effective is one composed of 8 or 10 per cent. of sulphuric acid; the articles should be left in for half-an-hour before being washed, and afterwards plunged in the alkaline copper solution.

GAS OF LONDON.—Dr. Letheby, the medical officer of health and gas analyst for the City of London, in his report, just issued, points out that before the Metropolitan Gas Act of 1860, when the price of the Great Central gas was but 4s. per 1,000 cubic feet, the average illuminating power of the gas, as estimated by the new burner, was 14·79 standard sperm candles; whereas since the passing of the Act, when the price has been 4s. 6d. per 1,000 cubic feet, the average illuminating power of the gas been but 13·63 candles. Of the 870 examinations of the gas of each of the companies during the year, the gas of the City Company has on 31 occasions been below the standard of the Act, that of the Chartered Company on 14 occasions, and the Great Central on 4. The chemical quality of the gas has, in one particular, been rarely equal to the requirements of the Act of Parliament. He alludes to the excessively large amount of sulphur which has been almost always present in the gas supplied to the City; and states that the proportions of sulphur in the gas have been larger and larger with every succeeding quarter of the year. The amount of sulphur in the gas of the City Company has ranged from 14·2 grains per 100 cubic feet to 28·2—the average being 19·6 grains; in the Chartered gas it has ranged from 13 grains to 30·7—the average being 21·2; and in the Great Central it has fluctuated from 14·4 grains to 32·9—the average being 24·1. He also states that of the 220 experiments made on each of the companies' gas during the year, there were 87 occasions with the City Company, 126 with the Chartered, and 212 with the Great Central, when the proportions of sulphur were excessive, making a total of 425 out of 664 occasions when the requirements of the Act of Parliament were not fulfilled. Such amounts of sulphur were not found in the gas of the City companies before the passing of the Metropolis Gas Act of 1860. The following were the proportions obtained with the same instruments from 1853 to 1859.

	Amount of Sulphur per 100 cubic feet of Gas.
Great Central Company	16·4 grains
Chartered Company	21·5 „
Commercial Company	17·1 „
Average......	18·3 „

In the gas of twenty-four of the towns of England he has ascertained that the proportions of sulphur rarely reach to 20 grains in the 100 cubic feet; in nineteen instances it was below 15 grains, and in seven instances below 10 grains. The two causes which are chiefly concerned in the excess of sulphur in the gas supplied to the City, are—(1.) The presence of pyrites in undue quantity in the coal; and (2.) The imperfect purification of the gas. While the gas of the City Company was so free from sulphur, the greatest care was taken to remove the pyrites from the coal; and in proof of the imperfect purification of the gas, he states that he has had no difficulty in removing much of the sulphur from the so-called purified gas supplied to the public. This is not merely a laboratory result, for it has been tried on a very large scale at the gas works at Nottingham, by Mr. Hawksley. In reviewing, therefore, the whole of these facts, Dr. Letheby concludes that the main cause which has operated in lowering the chemical quality and illuminating power of the gas of this metropolis, is the substitution of oxide of iron for hydrate of lime as a purifying agent; for not only does the former substance fail to remove the more complex sulphur compounds from the gas, but it also fails to absorb carbonic acid; and thus the gas is both chemically impure and of lowered illuminating power. In former times, when hydrate of lime was the purifying agent, and so also where it is still used in the towns of England, the purity and illuminating power of the gas, from the same coals, are higher than they are in London.

Commerce.

THE OPIUM TRADE IN CHINA.—The opening of the ports on the Yang-tze, and of Ché-foo, Tientsin, and New-chang, in the north of China, has created a great change in the opium trade of Shanghai. Formerly the supplies of this drug necessary for the requirements of all North China were purchased at this port by the native dealers, and by them distributed to the consuming districts. The new ports now receive their supplies through foreigners, and Shanghai has become more a depot for receiving and transhipping opium than a market for extensive sales. A few of the old wealthy native merchants still make considerable purchases for shipment to the northern coast and there is a large local consumption to be supplied, but still sales on the spot are much reduced from former times. Malwa and Patna are the two descriptions of drug imported. Benares, on account of its cheap price, has of late been coming into consumption, and in time will, doubtless, be more generally used. A few years ago Patna was only taken in very small quantity, but now it occupies a most important position in the imports to China; and the statistics of the trade show how steadily the demand for it has grown. Its much lower cost, as compared with Malwa, has brought it chiefly into consumption in the province of Shanghai. The northern and Yang-tze ports are supplied with Malwa. When the river was first opened, the ports of Kin-Kiang and Hankow took off very little opium indeed, and it was thought the native drug was too cheap to admit of India opium being imported; but of late years Malwa has been steadily coming into favour, and the trade is now important. The deliveries in 1863 were 31,568 chests; in 1864 29,721 chests; last year they again increased. The export of opium into the province of Canton is said to be 1800 piculs a month (240,000 lbs.), of which about 700 find their way to the city; the largest part of the importation is smuggled. In 1862 about 4,000 piculs passed the custom house; and for the first four months of 1863, the receipts increased to more than 600 piculs a month. In May of that year a government war tax of 16 taels a picul was imposed. The levying of this tax no doubt increased smuggling, for the amount passed by the custom house dropped at once to from 175 to 200 piculs per month, at which rate it has remained ever since. The quantity which passed the customs at Canton was, in 1860, 2,340 piculs; 1861, 1,361 ; 1862, 3,912; 1863, 3,809; 1864, 2,490; one-half being Malwa, the other half Patna. The import at Ningpo was 2,763 chests in 1863, and 3,307 chests in 1864; of which 2,410 chests were Malwa. Attempts have been made to introduce Persian opium into consumption, but without success. At the port of Che-foo the consumption is about 100 chests per month. At Kin-kiang 2,100 chests annually.

CHINESE WOOL.—The export of sheep's wool from Tien-tsin has steadily decreased within the last four years, the quantity exported in 1864 (370 piculs of 133 lbs.), being only a little over one-fourth of that exported in the previous year. That of camel's wool or hair has, on the other hand, increased each year since 1861. In 1864 the shipments were 428 piculs. The tariff duty on this article was lowered by the Chinese, at the close of last season, and fixed at 5 per cent. *ad valorem*, a charge which will probably give a considerable impetus to the export of this product during the present year. Camel's wool comes principally from Mongolia, and foreign merchants must send their agents there to purchase it, the trade not having yet reached that stage in which the article would be brought down by the Mongolians themselves to Tien-tsin for sale.

THE AMERICAN COTTON SUPPLY.—We (*United States Economist*) are enabled to present to our readers the result of a very careful estimate of the total supply of cotton in the United States on Feb. 1, 1866. The statistics have

been compiled from a survey of the stocks at the several points, under the auspices of a number of manufacturers and merchants, and are, we understand, endorsed by the Secretary of the Treasury, as approximating official estimates based upon the reports of Treasury agents. The following is the estimate of cotton in the United States on February 1, 1866:—

	Bales.
Cotton in New York city	327,000
Cotton in other cities, viz., Boston, Providence, Philadelphia, Baltimore, Wilmington, Charleston, Mobile, New Orleans, Florida, and other Texas ports, St. Louis and other Mississippi river ports	600,000
Estimated to come forward from the interior (the estimates are made by commission merchants and others who have agents throughout the South where there is a probability of cotton being for sale)	550,000
Total number of bales	1,477,000

The amount gone into consumption and exported during the nine months from May 1, 1865, to February 1, 1866, is thus shown:—

	Bales.
Supply in the United States, May 1, 1865	2,255,000
" " Feb. 1, 1866	1,477,000
Consumed and exported in nine months	778,000

Of a total supply of 2,225,000 bales on May 1, 1865, we have, up to February 1, 1866, shipped and taken into consumption at home 778,000 bales, and have 1,477,000 bales for supplying foreign and domestic spinners until the new crop comes to market. The home consumption and export combined, averaged for the nine months ending 1st February, 87,555 bales per month; the stock on hand, after deducting 500,000 bales for stock at the ports, will yield from February 1st to September 1st an average monthly supply of 139,571 bales, or 60 per cent. more than the average during the former period. At the same time New England is largely supplied with cotton. The stock held at the mills of that section is estimated at 185,000 bales, which, upon an average weekly consumption of 12,000 bales is equal to a four months' supply. Such are the facts connected with the supply of cotton, as nearly as it is possible to estimate. They show that our manufacturers, as well as those of England, have been acting under a grave hallucination as to the stock of cotton, and consequently as to its value. It would be very unsafe to assume that already the price has fallen to the level demanded by the discovery of the actual supply. With a certain supply of 2,500,000 bales from the next crop, and possibly even a much larger amount, it is impossible that current prices for raw cotton can be much longer maintained.

Colonies.

Newfoundland.—The area of Newfoundland is estimated at about 25,000,0000 acres; about 230,000 are in possession and 60,000 under cultivation. Nearly all the farming is done within a mile or two of the sea coast. The crops consist chiefly of hay, potatoes, and turnips, but oats, barley, and wheat are successfully cultivated. The great source of wealth in Newfoundland is its fisheries. For a quarter of a century it has usually 100,000 quintals of dried cod-fish per annum, the value ranging from about 250,000 dols. to 5,000,000—this does not include the exports from Labrador; and there is besides a quantity of other fish oil and skins imported from Newfoundland. The exports as reported at the custom-house have for a series of years exceeded the imports. In 1862 the exports amounted to £1,171,723, and the imports to £1,007,082. Spain, Portugal, Italy, and the West Indies take a large proportion of the fish. On the other hand, Newfoundland buys a great deal from the United Kingdom, and pays chiefly in money. The imports from the United Kingdom in 1862 amounted to £353,813, and the exports to £327,019. The list of imports into Newfoundland comprises large quanties of provisions, every article of which can be supplied from Canada, and when Newfoundland has joined Ottawa, and a closer connection has been established between the two colonies, and postal communication has been provided, it is inevitable that Newfoundland must draw a very large proportion of its supplies from Canada. In 1862 the exports from Canada to Newfoundland amounted to little more than £50,000.

Cotton in Queensland.—Cotton has fallen into some disrepute, in consequence of the losses sustained by the various companies engaged in its growth, but the yield of the crop grown in 1865 was such as to induce the owners of almost all the farms on which it was grown to plant a greater breadth of land in the latter part of the year. Recent accounts state that from the appearance of the crop then growing the yield of the present crop, should the gathering season prove reasonably dry, will be much larger than in any previous year. It is not on large estates but with small farmers, where the members of a family can be profitably employed in picking cotton, that the success of this industry is to be looked for.

Melbourne Exhibition.—At a meeting of the Intercolonial Exhibition Commissioners, on the 22nd January, on the subject of providing necessary accommodation for the forthcoming Intercolonial Exhibition, it was resolved that a permanent building be erected on the site of the Exhibition Reserve, at an estimated cost of £10,000, including the cost of enclosing the ground.

South Australia.—The following table shows the population of the colony from its foundation in 1836 to the present time. The first census was taken on February 26, 1844; subsequently, every five years. It also shows the value of the exports each year, and the average of such exports per head of the population:—

Years.	Population.	Exports.	Avge. per head.
1840	14,610	15,650	£1 1 5
1845	21,759	131,800	6 1 2
1850	63,700	545,039	8 11 2
1855	96,982	686,953	7 1 8
1860	121,960	1,576,326	12 18 6
1865	156,704	2,754,657	17 11 7

The exports of produce, up to 1840, consisted of wool, whalebone, and oil, but since then they have become more general, and may be classed as under:—

Exports.	1864.	1865.
Agricultural	£1,480,745	£1,233,469
Horticultural	10,808	10,021
Dairy	11,147	8,114
Animal	794,502	844,335
Minerals	691,624	620,212
Manufactures	18,888	21,442
Natural productions..	7,541	15,967
Unenumerated	282	1,097
	£3,015,537	£2,754,657

The total value of the imports during 1865 was £2,927,596, being an increase over those of 1864 by £514,665. The sales of Crown lands during 1865 amounted to 317,298 acres, realising £519,025. The average price in 1860 was £1 12s., which is higher than any year except 1854, when £1 15s. was the average. The estimated area of the province of South Australia is 245,172,837 acres; the quantity sold to the end of 1864 is given as 2,894,585 acres. By adding the sales of 1865, it will appear that the total quantity of land sold to the end of last year was 3,211,833 acres, leaving an area of 241,960,954 acres unsold. This quantity

exceeds the entire area of the United Kingdom by 163,528,363 acres.

Obituary.

Mr. Charles Wye Williams died on Monday, April 2, aged eighty-seven. When a young man he practised as a barrister-at-law on the northern circuit, but he speedily abandoned this profession. At the beginning of the present century, Mr. Williams was the acting partner in large bleach works in the north of Ireland, and he there had occasion to make himself familiar with the principles and the practical application of chemistry. He listened to the first enunciation of the atomic theory by William Higgins, and attended the first lectures which Davy gave in Dublin, as well as those also of the late Dr. Andrew Ure, between whom and Mr. Williams a strong friendship sprung up, to end only with the death of the former. When Mr. Williams's book on the combustion of coal was first put to press, in 1839, Dr. Ure corrected every proof-sheet with his own hands. In 1806-7 Mr. Williams erected a large linen mill in Ireland, and introduced into it, for the first time in that country, iron spur gearing, cast by Edwards, of Belfast. In 1822 Mr. Williams went to the cost of patenting and introducing the feathering wheel, invented by his friend, Mr. Oldham, and known as the Oldham wheel, and which, under some modifications, at last became known as the Morgan wheel. In the next year the present City of Dublin Steam Packet Company was formed, under the style of Charles Wye Williams and Co. Six steamers were progressively built, and the present style of the company was at last acquired under the provisions of a charter granted in 1828, Mr. Williams continuing, until within the last few years, to be the managing director. The company's Act was obtained more especially to enable them to place steam vessels upon the river Shannon, upon which half-a-million of money was some time after expended in improving its navigation. The company obtained further Acts, one so late as 1860, to enable them to raise the capital to construct the four magnificent steam vessels which now maintain the service between Holyhead and Kingstown, and in the construction of which Mr. Williams, at the ripe age of eighty, took a warm interest, journeying up to London to witness the casting of the cylinders of the *Leinster*, at Messrs. Ravenhill, Salkeld, and Co.'s. Very shortly after the City of Dublin Steam Packet Company was formed, Mr. Williams and his co-manager, the late Mr. Francis Carleton, undertook the formation of a Transatlantic steam service, and they built the *Royal William* and bought the *Great Liverpool*, both of which vessels made several voyages to New York shortly after the first trips of the *Sirius* and *Great Western*. The Atlantic Company did not succeed, however, and Mr. Carleton and the directors of the then Peninsular Steam Company formed the present Peninsular and Oriental Steam Navigation Company, which took over the steamship *Great Liverpool* for their Indian service. Mr. Williams, at a very early date, applied water-tight bulkheads to divide a ship into separate compartments; and this improvement formed the subject of a paper which he presented to the British Association in 1837. The first edition of Mr. Williams's treatise on the combustion of coal was printed in 1839, the City of Dublin Steam Packet Company, by the desire of the directors, assuming the whole cost of publication. In the course of an experience in the building and equipping of ships, he had perceived that, "notwithstanding the improved state to which the construction and appointments of the hull and general machinery of steam-vessels had arrived, great uncertainty and risk of failure still prevailed in the use of fuel and the generation of steam." He found that the cause of this uncertainty and risk of failure lay "in the absence of any well-found principle in the construction of the boiler," and "that the part on which most depended appeared least understood and least attended to, namely, the furnace," which "was too often left to the skill (or want of it) of working boiler-makers or bricklayers." In his laboratory he sought for the remedy by practical experiments, and succeeded in inventing a model boiler and furnace, with which he entered the lists in the great competition of makers of marine steam-boilers at Newcastle for the £500 prize. The professional umpires on that occasion were Sir William Armstrong, Dr. Richardson, and Mr. Longridge, who decided in favour of Mr. Williams's system, which they pronounced to be "applicable to all descriptions of marine boilers," while "its extreme simplicity is a strong point in its favour." Mr. Williams presented the £500 to a popular institution. For an essay on "The Prevention of the Smoke Nuisance," Mr. Williams received, in 1856, the Society of Arts' £25 Gold Medal, the value of the prize being enhanced by its presentation by the late Prince Consort. Mr. Williams published an able paper "On the Construction of Marine Steam Boilers," which he read at the Institution of Naval Architects; a pamphlet on "The Steam-generating Power of Marine and Locomotive Boilers;" and in 1860 appeared Mr. Williams's last work, the results of experiments upon which he was still engaged when in his eighty-first year. This was upon "Heat and Steam." It advanced the curious view that water, as water, could have no other temperature than 32°, and that any greater apparent warmth was due to the presence of steam diffused among it. Mr. Williams was an associate of the Institute of Naval Architects and of the Institution of Civil Engineers, and a member of the Society of Arts, having been elected in 1854. The remains of the lamented gentleman were interred at St. James's Cemetery, Liverpool. The pall-bearers were Messrs. J. C. Ewart (late M.P. for Liverpool), W. Watson, P. Howell, J. J. Hance, J. K. Rounthwaite, and E. J. Reed (chief constructor of the navy). Upwards of one hundred of the *employés* of the City of Dublin Company followed the remains to the grave.

Publications Issued.

A Dictionary of Chemistry, by Henry Watts, B.A., F.C.S., assisted by numerous contributors. (*Longmans.*) Part XXXIII. of this work is just issued, and deals with articles from "Phosphorus" to "Potassium."

The Popular Science Review. Edited by Henry Lawson, M.D. (*Robert Hardwicke.*) The last number of this work, which is published quarterly, has just made its appearance, and contains articles on the "Volvox globator," entozoon-like bodies in the muscles of animals destroyed by the cattle plague; our house-spiders; raised beaches and their origin; milk and its adulteration; the amœba, its structure, development, and habits; the sofatara and fumaroles in the neighbourhood of Naples; and the graphotype. To these are added reviews of scientific works, and a scientific summary.

Notes.

Trains at London-bridge Station.—The *Railway News* says that on Easter Monday last year 850 trains, engines, &c., passed under the A.B. signal-box during the 18 working hours, from six o'clock to twelve midnight. This was at the rate of a train at about an average of every minute and a quarter for the 18 hours. The trains conveyed 250,000 persons, all without a single casualty. On Easter Monday last, which was earlier in the season than the year before, 915 trains were signalled out and in at London-bridge station, and of these above 700 trains were signalled at the A. B. station. The total number of passengers, out and in, at London-bridge was about 200,000, of whom about 45,000 were carried to and from Greenwich.

Precautions against the Cattle Disease.—It is said that phenic acid was the principal substance used in the Jardin d'Acclimatation in the Bois de Boulogne to prevent the spread of the disease amongst the animals in that establishment. More than twenty pounds of this acid were used daily in washing the walls and mangers and in sprinkling the floors of the stables and enclosures, and it is to its constant use that the arresting of the malady is generally attributed. Doctor Déclat, of Paris, has recently published a work on phenic acid as a disinfectant. The doctor adopts the theory that cholera and other diseases are caused by the presence of animalculæ in the blood, just as liquids are thrown into a state of fermentation and decomposition, and that phenic acid, used either in the shape of solution for sprinkling apartments, stables, and other places, or worn about the person in the form of an impregnated bag, but especially in the former way, is a most valuable means of prevention. "Phenic acid, the alkaline phenates, and coal tar, are," says the doctor, "the best preservatives known against the development of these animalculæ, and, consequently, against contagion;" and, he adds, "they have not the inconvenience of chlorine, the vapours of which cannot be inhaled with impunity." For sprinkling purposes it is recommended to dissolve the phenic acid in five times its weight of alcohol, and then dilute with water. A more economic form is that of coal tar, with which it is recommended to treat the walls, woodwork, and even the floors of places in which animals are kept, and also the horns and hoofs of the animals themselves. Another recommendation is to let the animals drink water in which coal has been mixed for a certain time; it is said that pigs, when ill, seek for coal and devour it with avidity, especially when mixed with their ordinary food. The sanitary value of phenic acid and its compounds is well known in England, but every new piece of evidence is worth recording.

Agricultural Commission in France.—The Imperial Government has just organised the commission whose duty it will be to inquire into the condition of agriculture, and to inquire into the causes of the serious complaints made by the friends of the agriculturists in the Corps Legislatif. A central commission is appointed to sit in Paris, and preside over the whole inquiry. The commission will be presided over by the Minister of Agriculture, or, in his absence, by one of his colleagues; and M. Monny de Mornay, the Director of Agriculture in the first-named ministry is appointed commissaire-general of the inquiry. Amongst the other members of the commission are M. Chevreul, president, and other members of the Agricultural Society of France; MM. Comlees, Chevalier, Boussingault, Dumas, members of the Institute of France. The commission will appoint its own members or other persons to act with the Prefect as local commissioners, and, in order to systematize the action of the whole, the departments are arranged in six groups, according to their agricultural character. There is no doubt that the inquiry will elicit facts that may be advantageously used elsewhere as well as in France.

MEETINGS FOR THE ENSUING WEEK.

Mon.....British Architects, 8.
Society of Engineers, 7.
Medical, 8. 1. Clinical Discussion. 2. Dr. Broadbent, "On Chorea."
Royal Inst., 3. Prof. Du Bois Reymond, "On Muscular Contraction."

Tues... Civil Engineers, 8. 1. Discussion on "The Maintenance and Renewal of Permanent Way." 2. Mr. T. A. Rochussen, "On the Performance, Wear, and Cost of Maintenance of Rolling Stock."
Statistical, 8. Prof. W. S. Jevons, "On the frequent Autumnal Pressure in the Money Market."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Prof. Frankland, "On the Non-Metallic Elements."

Wed. ...Society of Arts, 8. Dr. Thudichum, "On the Diseases of Meat as affecting the Health of the People."
Meteorological, 7.
Royal Inst., 3. Prof. Du Bois Reymond, "On Muscular Contraction."

Thur. ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. George Bentham, "On the Structure and Classification of *Myrtaceæ*."
Chemical, 8. Prof. Cary Foster, "Heat of Chemical Action."
Numismatic, 7.
Royal Society Club, 6.
Royal Inst., 3. Prof. Frankland, "On the Non-Metallic Elements."

Fri ......Society of Arts, 8. Cantor Lecture. Dr. Crace Calvert, "On the Transformation of Neutral Substances." (Lecture II.)
Philological, 8.
Royal Inst., 8. G. Macfarren, Esq., "On the Music of the Church of England."

Sat ......Royal Inst., 3. Mr. George Scharf, "On National Portraits."

Patents.

From Commissioners of Patents' Journal, April 6th.

Grants of Provisional Protection.

Carriage wheels—877—T. Johnston and T. W. Rennie.
Disease, treatment of—899—W. T. Cooper.
Electrical indicator—883—W. Moseley.
Fibrous substances, preparing—869—F. A. Calvert.
Fire-arms, breech-loading—847—J. Jackson.
Galvanic batteries—885—W. Moseley.
Gridiron—829—J. Denis.
Heavy bodies, raising and lowering—849—R. A. Hardcastle.
Pins—867—A. and J. Trotman, and T. J. Cole.
Pistons, packing—865—T. Ironmonger.
Printing, blocks and plates for—887—J. Ramage and T. Nelson.
Ships and vessels, closing hatchway skylights of—855—W. R. Mulley.
Steam engines and boilers—861—W. L. and T. Winans.
Targets, indicating shot marks on—790—B. R. Wethered.
Textile fabrics, dyeing and printing—897—J. Higgin.
Textile fabrics, pencil for writing upon—873—A. V. Newton.
Textile materials, applying metallic substances to—893—W. E. Gedge.
Watch and chronometer cases—881—T. Adams.
Water-carts—889—J. Rawsthorne and B. H. Bayley.
Wines, preparing—490—E. Dreveton.

Inventions with Complete Specifications Filed.

Fire-arms, breech-loading—914—G. T. Bousfield.
Knitting machine—949—C. A. Shaw.

Patents Sealed.

2583. J. Priestley, W. Whitworth, and J. Sutcliffe.
2595. G. Voight.
2597. R. Walmsley.
2600. W. E. Gedge.
2607. G. G. Rich.
2610. J. H. Johnson.
2615. J. J. Parkes.
2622. W. E. Gedge.
2624. D. C. Pierce.
2635. G. and A. Deslandes.
2652. J. Tangye.
2673. A. Fenton.
2696. J. Everard.
2708. S. R. Rowe.
2770. R. B. Sanson.
2950. A. V. Newton.
210. J. Stringer and G. Birch.

From Commissioners of Patents' Journal, April 10th.

Patents Sealed.

2619. J. Crutchett.
2620. J. Crutchett.
2626. J. Linton.
2640. M. Cartwright.
2632. J. U. Bastier.
2634. W. C. Cambridge.
2649. G. B. Woodruff.
2653. W. J. C. Macmillan, J. Mason, and J. V. Scarborough.
2656. J. L. Hancock.
2657. J. C. Ridley.
2658. C. A. Elliott.
2660. A. J. Mott.
2661. F. Wise, E. Field, and E. H. Aydon.
2662. W. Clark.
2665. J., S. A., G. E., and F. E. Reading.
2666. J. B. Robertson.
2676. F. G. Sicardo.
2693. J. Taylor, jun.
2699. J. Ballard.
2701. W. Clark.
2702. W. Clark.
2726. J. Wright.
2895. A. V. Newton.
3283. W. Clark.

Patents on which the Stamp Duty of £50 has been Paid.

306. T. L. Jacobs.
875. J. Macintyre.
889. W. H. Mitchel.
865. B. Cooper.
870. J. Burwin.
878. R. A. Brooman.
879. R. A. Brooman.
904. A. V. Newton.
913. H. W. Ripley.
921. P. P. Baly.
924. J. Ramsbottom.
929. R. Reeves.
936. W. and J. Keats.
938. J. Keats and W. S. Clark.
976. G. A. Buchholz.
1066. H. W. Ripley.
951. C. Ferrett.
970. C. Turner.

Patents on which the Stamp Duty of £100 has been Paid.

862. W. Owen.
883. W. Henderson.
860. E. Fairburn.
881. W. Hooper.
889. J. H. Young.
952. J. L. Steward.
997. L. P. Parker.

Journal of the Society of Arts.

FRIDAY, APRIL 20, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'Clock:—

April 25.—"On the Perils of Mining, and the Means of Preventing them." By Jabez Hogg, Esq.

May 2.—"On National Standards for Gas Measurement and Gas Meters." By George Glover, Esq.

Cantor Lectures.

A course of four lectures "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," is now being delivered by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture II.—Friday, April 20th.

"On the Transformation of Neutral Substances."

On the transformation of *starch* into *cane* and *grape sugars*, and also *pectic acid* (with remarks on the ripening of fruits and the production of jellies). On the transformation of *sugar* into *alcohol, ether, aldehyde, acetic, formic, prussic, oxalic*, and *butyric acids* (the acid of rancid butter), and also the conversion of *sugar* into *mannite* (obtained also from manna), and into *lactic acid* (acid existing in the blood and flesh of animals, and also in sour milk).

Lecture III.—Friday, April 27th.

"On the Transformation of Organic Acids and Animal Substances."

The artificial production of *benzoic acid* (found in benzoin resin) from the essence of *bitter almonds* and from *coal tar* products, and its conversion into *hippuric acid* (found in the secretion of herbivorous animals); of *tartaric acid* (the acid characterising cream of tartar), from *sugar of milk* and from *succinic acid* (the acid obtainable from amber), and its decomposition into *oxalic* and *acetic* acids—On the transformation of *citric acid* (the acid of lemons and oranges) into *aconitic acid* (found in wolfsbane)—On the transformation of *malic acid* (which characterises the acid flavour of green gooseberries, apples, and rhubarb) into *fumaric acid* (the acid of common fumitory) and also into *equisetic acid* (the acid found in the marsh horsetail), and, lastly, into *asparagine* (the body found in asparagus and potatoes)—On the transformation of *uric, cyanuric*, and *cyanic* acids into *allantoin* (the substance found in the allantoid fluid of cows)—On the artificial production of *urea* (a substance which characterises the liquid secretions of man and of many other animals).

Lecture IV.—Friday, May 4th.

"On the Artificial Production of Aromatic Substances."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadow-sweet, coumarin*, and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor*; of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

The lectures will commence at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture.

The substance of these lectures will appear in the *Journal* during the autumn.

Proceedings of the Society.

Musical Education Committee.

The Committee met on Wednesday afternoon, February 7th. Present—Henry Cole, Esq., C.B., in the chair, Sir John E. Harington, Bart., Rt. Hon. Sir Geo. Clark, Bart., Edgar Bowring, Esq., C.B., Lieut.-Col. Scott, R.E., Capt. Donnelly, R.E., and R. F. Puttick, Esq.

Mr. John Hullah examined by the committee.

858. You were a pupil of the Royal Academy of Music?—I was in the Academy for a short time.

859. At what period?—Nearly thirty years ago; I was a student of singing only.

860. Who was the principal of the Academy then?—M. Cipriani Potter.

861. Are you familiar with the present state of the working of the Academy?—Not at all; I have not visited it for a long time past.

862. You have no wish to give evidence to the committee upon the existing state of the Academy?—I know nothing, save by hearsay, of the existing state of the Academy. I consider that the Academy has been useful to the country in past times, and may be useful still. The inevitable occupation of the majority of English musicians is teaching—principally teaching one instrument—the pianoforte—and the Academy has improved the quality of English pianoforte teaching, and educated a large number of teachers. These, for the most part, lead quiet and unnoted, but very useful lives. I think that a good deal too much is expected of academies. They cannot create genius. Considerable periods must intervene in the history of every art during which very little original faculty, whether creative or executive, presents itself; for even the supply of first-rate executive skill seems attended with uncertainty. The Paris Conservatoire, for instance, with its large subvention and admirable staff, is far fron being successful in every department. It by no means keeps the Académie Royale supplied with first-rate singers. Who can be said at the present time to fill the the places of Falcon, Nourrit, or Levasseur? It is so also in the dramatic school. The only successful *tragedienne* of late years has been an Italian, Madame Ristori. The best actors now at the Théâtre Français were celebrated thirty years ago. Who have succeeded Mars or Rachel? Who are the rising artists likely to succeed Plessis and Regnier?

862. Are the committee to conclude from those opinions that you think an Academy of Music is unnecessary?—Certainly not: by no means. The Royal Academy was never "unnecessary," and might have been most useful; but it has suffered grievously, ever since its origin, from want of funds, from impecuniosity and the depressing influence of a continual struggle for existence. I have been looking lately into Mr. Cazalet's "History of the Royal Academy of Music." It is one long story of pecuniary difficulties.

I find that within two years of its foundation it was only saved from destruction by a wide departure from its original plan, and by the very objectionable resource of prevailing on the professors to teach during a certain period gratuitously. A year or two after this I find that the Academy was saved from destruction by the admission of a mob of students, whose sole qualification seems to have been the ability to pay for their instruction. After this, public concerts were established, which were "successful" (*i.e.*, they paid their expenses) for one year; but in the next year, the scheme proving unproductive, the Academy was again on the point of being closed. This again was averted by a loan without interest—no mention of the repayment of which is recorded. After this the institution struggled on for a few years longer. Then came the Westminster Abbey Festival, in 1834, which helped it a little. After that the friends of the Academy took to dancing for its benefit, and it was kept alive for some time by a succession of balls; and so on to the end of the chapter. It seems to me that the great desideratum of an academy of arts is the power of selecting—which involves also rejecting—its pupils. In places of general education something must be done, and can be done, even for the dullest; not so in a place for special training. The art and the individual are equally wronged, I think, by retaining in a school of music persons who, it is certain, will never learn to write, play, or sing decently.

863. You think if the Academy provided by some means for the tuition of real musical ability it is not expedient that it should admit other pupils, merely on the payment of the fees, who may not seek to be professors or performers?—No; I am not quite of that opinion; but I think there should be some general principle of selection, and that persons whose incompetency was ascertained, however much they were disposed to pay, should not be allowed to continue students. The difficulty, however, with which a poor academy has to deal, is not so much in being obliged to admit the incompetent as in being obliged to reject the competent. It must often not only receive unpromising students who can afford to pay, but, what is worse, exclude promising students who cannot.

864. Assuming an arrangement could be devised by which persons of eminent ability could be taught gratuitously, and supported while being taught, and persons of less ability could be admitted, either without fees or at nominal fees, and that another class could be admitted at very low fees—assuming all these gradations to be established, should you still object to the public coming in and paying a very high fee, such as would be amply remunerative, and even contribute considerably towards the expenses of the institution?—No; I should not. I contemplate several classes of pupils.

865. Amateurs?—Yes. It would be impossible to shut them out, even were it desirable to do so. The history of Queen's College will prove that. It was instituted with the express view of assisting and facilitating the education of a class—governesses. But a practical difficulty arose at once—how to distinguish between governesses and others. It was found that such a distinction could not be made, and everybody who applied for admission had to be admitted.

866. It has been stated in evidence before the committee, that on one occasion a lady took her two daughters to the Academy to enter them as students, and on its appearing that they had no musical ability, either in their fingers or voice, she was asked why she brought them to the Academy, when her reply was, that her doctor had recommended her to do so. You, of course, would exclude manifest incompetency and inability; but you would not microscopically investigate the reasons why a person entered, or probe very much their ability, provided they paid a very adequate and competent fee?—No; I should not.

867. But, whilst admitting the public, you would take care they did not impede the real business of the institution?—Certainly. I think, especially at first, there might be a great rush of idle people in search of a sensation—people who did not care to learn anything, but who wanted amusement.

868. You would make them pay highly?—Yes; but I do not think any payment would compensate for the nuisance caused by their presence.

869. That would be a matter of control or direction? —Of course the directors would have power to refuse admission to any one, or to suggest to a pupil that he had better not come any more.

870. In the view you intimate it is obvious there must be a fund, more or less in the nature of an endowment, to enable the institution to be all that it should be?—Certainly. Few places of education have been permanently self-supporting.

871. Including Oxford and Cambridge, Eton and Harrow?—Yes. Endowment is to an institution what the fly-wheel is to machinery—it prevents its moving by jerks. I have in mind at this moment a public school of which the numbers rose at one period to an enormous amount. It suddenly went out of fashion, and it must have been closed but for its endowments. I do not believe this is an exceptional case.

872. By endowment you do not imply payment without results?—Educational results are difficult to ascertain, but I think in music they are to be ascertained, approximately at least.

873. Is it your opinion that it would be a more feasible policy to attempt to improve the existing Academy than to attempt to create a new institution?—I think the present Royal Academy should, if possible, be saved from extinction. I do not know how far this is possible, but I should be sorry to believe it otherwise, and unwilling to give it up without an effort. It is more conformable to English feeling and habit to reform, repair, and restore old institutions than to call into existence new ones. If, as a preliminary to the birth of a new Academy, the *coup de grace* were to be given to the old one, I think the long sickness and death of the latter would be a powerful and popular argument against the endowment of the former. One Academy, it would be said, has been tried for forty years, and has come to a bad end. The thing is an exotic, and will not flourish here. The English are not a musical people, &c. Of course all this can be answered, but, a cry once got up, answers to it are little heeded. The existing Academy has been compared, I find in former evidence before this committee, to an old coat. Now, if an institution with any life in it can with propriety be compared to any kind of old coat, it must be to one of those old coats referred to in Swift's "Tale of a Tub"—coats which adapted themselves to every size and variety of figure, and, being kept nicely brushed and occasionally repaired, lasted for ever. In this sense the British Constitution is an old, a very old coat, which, in our own time, has out-lasted half-a-dozen bran-new garments which a neighbouring nation has put on and off in succession. The existing Royal Academy has one enormous advantage over any proposed institution—the simple one that it exists. It is ill, very ill indeed—moribund, perhaps, but not dead yet; and "while there's life there's hope." It has a name—the Royal Academy of Music—for which it would be difficult to find a substitute, and which could not at present be appropriated by a new institution. It has a charter, and I suppose it has some funds. It has—at all events it has had—some reputation. There are, no doubt, practical difficulties in the way of grafting new ideas on an old conception, and virtually reforming the existing institution, but I cannot conceive that these difficulties are insurmountable.

874. You do not see any practical difficulty or impossibility, in the Royal Academy of this country being as efficient as the conservatoires of other countries, do you?—No difficulty of any kind.

875. You do not sympathise in the opinion that the English, as a nation, are not a musical people?—No; but I think there is this difference between England and other countries—that the greatest aptitude and the finest taste, in foreign countries, are found among the aristocracy, and that precisely the reverse is the case in England. I say this after a very long continued observation. We go, for instance, to a national school to commence a singing class, and out of 100, or even 200 children, boys and girls, there perhaps will not be one who cannot, the first time of trying, sing the scale fairly in tune. We go to a public school like Eton or Harrow, and out of every half-dozen boys, one or two will make the most hideous noises that can be conceived. I make every allowance for temper and unwillingness to learn; but the difficulties of teaching music in schools of the higher classes are enormously greater than in those of the lower.

875a. Have you found the same in the Wellington College?—I know nothing of Wellington College personally. It is better than it was, everywhere; the national ear has improved. Still, at present, the number of persons who have no aptitude for music is very great among the higher classes.

876. Would you apply this remark equally to the female portion of the higher classes?—Undoubtedly: certainly.

876a. Although there is no lack of desire on their part to engage the most competent musical talent in the world to try and teach them?—Not at all.

877. Do you consider this arises from any physical inability?—No; but from the physical powers called into requisition in music having been uncultivated among the higher classes in England for many generations past—since the middle of the seventeenth century.

878. You think, in a given number of children of the aristocracy and the same number of children of the lower classes, you find the largest amount of musical aptitude among the latter?—There is no comparison whatever.

878a. And that opinion applies equally to both sexes?—Yes; quite so.

879. The middle classes you except?—They share in the advantages and the disadvantages of both the other classes. Considerable difficulties would arise in the institution of an academy, from the fact that so small a proportion of the higher class takes any real interest in music. One thinks of the great officers—whether in church or state—and asks who is there amongst them that cares about music. Who among our nobility keeps, or even occasionally engages, an orchestra? Who among his friends would care to hear it if he did? Look at the list of subscribers to the Philharmonic or any similar concerts. English people of rank go to the opera. That is a social affair, which has little to do with music itself. I do not think that among the higher classes music is respected or valued very much. No Englishman hesitates to confess his ignorance of music; indeed, he generally proclaims rather than confesses his deficiencies in this matter, as though he expected to be admired for them. I am not stating this as a positive impediment, but as a difficulty.

880. And yet there are instances in which the sons of noblemen might be mentioned as examples proving your rule?—There are exceptional cases, no doubt, and they have become more numerous of late years, as they will become still more numerous in future years.

880a. You are aware that the Royal Academy of Music has at present a grant from Parliament of £500 per annum?—Yes.

881. Do you consider that adequate to the objects in view?—Certainly not.

882. You regard it as a beginning that may be beneficially enlarged?—Certainly.

883. You would be prepared, of course, if Parliament were disposed to vote the requisite funds, that such funds should be administered under proper conditions?—Certainly. I am not sanguine as to the success of an appeal to Parliament, especially as a first step. The spirit which all but "stamped out" English music in the seventeenth century is by no means without vitality in the present day. Any proposition to assist the theatres in any shape would be met by a howl of indignation. Supposing this, however, avoided, and that your scheme included only musical instruction in the abstract, it may be doubted whether the time has come for finding support for it in the House of Commons; but I think the State might contribute on conditions similar to those which regulate its connection with the training colleges for schoolmasters, which have not been established by Government grants, but assisted by them after they have been established by societies (largely aided by private munificence), the annual grants made by Government being in proportion to the annual outlay of those societies. An institution with supporters of this mixed character would probably be assisted by donations or legacies for scholarships, &c. This has been the case to a considerable extent at Queen's College, which only a few weeks since received a present of £1,000, a like sum being given by the same individual—a lady—to a similar institution.

884. Are you aware what has been stated in evidence before the Committee with regard to the parliamentary grant to the present Academy? There is a letter written by Mr. Gladstone, making it a condition of the continuance of the grant that the Academy should be able to show a satisfactory amount of public support?—I did not remember that. My own view is, I think, original, and has not been suggested by anything I have heard.

[The Chairman read the following extract from a communication from the Lords Commissioners of Her Majesty's Treasury, published in the *Journal of the Society of Arts*, Vol. 13, p. 635:—

"1. In the event of their taking any step such as has been shadowed out, they remain entirely free to consider what shall be the nature, particulars, and conditions of any aid which it may be proposed to give.

"2. In particular, they will deem it necessary to be assured, by sufficient proof, that the institution which may claim to be the immediate recipient of aid is not only one entitled to acknowledgments for past services, but is also in possession of the general confidence of the profession, and is constituted in the most effective manner, and on the most liberal principles for the prosecution of its purposes; or else is engaged in adopting such measures as may entitle it to claim to correspond with this description.

"3. They would think it necessary that measures should be adopted by the Royal Academy of Music to obtain a much more extended amount of voluntary support, so as to secure to it the character of an institution having the promise of permanence from its own resources, and seeking not to throw upon the state a task refused by private liberality, but to obtain by the countenance, as well as the funds of the state, power to prosecute its proper aims, upon a scale more fully adequate to their importance."

885. (To the witness).—Do you concur in those opinions?—Decidedly. Before, however, we quit the subject of endowment, I should like to advert to a point which has been mooted in reference to another source of income. It has been asked why an academy of music, granting that it cannot be supported by students' fees alone, cannot make up its shortcomings by concerts, as an academy of painting may do and does, by its exhibitions. Now there is no analogy between an exhibition of pictures and a concert. The exhibition of a picture, once finished, costs the painter nothing; on the contrary, it is to his advantage in every way that it should be seen. A concert that will be remunerative requires, at a particular time, the presence of a number of performers whose reputation is already made, whose time is their best property, and whose assistance can bring them nothing but loss. No doubt concerts of great interest could be given by the students only of an academy of

music, but the interest would be confined to a class that would not pay to attend them. If, however, an interest were got up in a new academy, a body of subscribers might be formed to whom concerts by the students would give pleasure—something, in fact, for their money. I am not, however, sanguine about subscriptions, which too often have to be kept up by all kinds of mean acts. Subscriptions would be useful, however, as indicative of interest in music, and would thus help to justify a government grant.

886. A suggestion was thrown out by Mr. Macfarren as to the importance and value of attaching a chapel to the Royal Academy of Music, which would be useful for the practice of church music and attractive to subscribers, (who might be disposed to take seats in the chapel) and to some extent remunerative to the Institution. That idea seems rather to accord with your own views as to concerts?—The subject is surrounded with difficulties, and I am not prepared to speak upon it.

887. Do you think it advisable generally to encourage performances in public by the pupils before their education is finished?—Yes, if it is quite understood what the performances and who the performers are—that the latter are merely pupils and not professors. That matter has been so little understood hitherto that comparisons have actually been made between the performances of the pupils in the Royal Academy and those of the members of the Société des Concerts of Paris! the one given by unfinished pupils, and the other by some of the first performers in the world, who have, in many instances, been playing together for 30 or 40 years.

888. Do the performances of the Paris Conservatoire include the whole of the students?—Certainly not; except, perhaps, as regards the choruses.

889. Are the members of the orchestra all former students?—I believe all are former students, but the *crême de la crême* of them. Taking a general survey of the Conservatoire orchestra, I should say there is not a man in it under (say) 40 years of age.

890. Are you aware if it is the habit in Paris to give concerts by the pupils alone with any publicity?—With a certain amount of publicity I believe it is done.

891. Are these concerts open to the public?—I think not,—only to certain privileged persons.

892. You would probably think it desirable that the concerts of the Academy should be heard chiefly by the subscribers, who would understand and appreciate the object for which they were given, *viz.*, to show the progress of the pupils, and not be open to the public in competition with other concerts?—Certainly. Moreover, a great incidental advantage is obtained for the students by such concerts; that through them they are practised in what is a difficult part of an artist's calling—appearance before the public. It has been my lot to bring forward a great many *débutants*. Some of them have been so incapacitated by nervousness that, but for extreme indulgence on the part of the audience, the performance in which they were engaged could not have been brought to an end. That would be avoided by appearances in semi-public performances.

893. Care being taken that the public, in ignorance of the objects, did not view the concerts as competitive with those of practised musicians?—Just so.

894. You are favourable, on the whole, to subscriptions, though you prefer to do without them if possible?—I think by subscriptions and students' fees, for a time, at any rate, a very considerable income might be raised; but I value subscription chiefly because I think it would be more easy to get a parliamentary grant as an addition to these, than to start with a parliamentary grant.

895. Do you think subscriptions would come to a new Academy readily, from an interest in music; or do you think there must be inducement held out to tempt subscriptions?—I think I would rely on the interest in the first instance, and then I would try and reward it in some way afterwards. I do not think you would have much difficulty, for a time.

896. You have already expressed a decided opinion
favour of fees?—I should wish to see them grad
At the same time I contemplate a large number of
scholarships,—even to the extent almost of
students in food and clothing, as I think you would
cases in which this help would be needful. At the
time my own experience of training institutions is
promising persons of the humbler classes almost inv
ably get assistance somehow. Somebody is always
to come forward and do a little for them.

897. Do you think something of the same kind w
be applicable to music?—Certainly.

897*a*. Have you formed any definite opinion as to
constitution of a new or improved Academy of Music
I am not prepared with a cut and dried scheme, b
have a general view which I would bring before
committee. I think the constitution of the new A
(however called) might approximate to that of
College. There would be a patron; in this in
apprehend, a patroness; a visitor; a council; a
lady visitors; a committee of education; a princip
working secretary; a lady superintendent. The
in whom the property should reside, should have the
trol of the finance and of all the business details;
should be a court of final appeal in all matters of
or difficulty that might arise among professors, stu
or others connected with the institution. The co
should consist chiefly of gentlemen not members o
musical profession—I say chiefly, not exclusively.
would frequently come before them in the solution
which professional experience and exact knowled
music would be most useful. I think, however, th
professional members of the council should be few a
as choice; men of high character and position—p
even men retired wholly or partially from active
The lady visitors should have access to all
lectures, or lessons in which female pupils
engaged. They should be able to exercise great
ence on the tone, not only of the female dep
but of the whole institution. Their advice would
be of great value to the council. At Bedford
several ladies are members of the council. The
mittee of Education should consist of the whole
professors, who should have the sole manage
everything relating to the work of the institution.
principal should be a musical professor, but should
actually teach in the Academy, still less out of it,
voting his whole time and attention to the gen
perintendence of the work of the academy.
musician, he would command an amount of
from the professors, and obtain an influence
students, which no mere amateur could possibly
Not acting as a professor, pretexts for jealousy
picions of favouritism (though nothing can render
impossible) would be reduced to a minimum. The
of professors (who would form the committee of
tion) should be formed with a view to instruction in
department of musical science and skill; if a school
musical drama were connected with the institution,
struction also in stage business, fencing and
must be added. The different classes of pupils
be (1) free; (2) partially free; (3) paying. Every
without exception, should study harmony and the
forte. Every male pianoforte student should
orchestral instrument. Choral practice should be
(the attendance at which should be compulsory)
twice a week; and the same with orchestral; and
ral rehearsals once a week. The suggestion which
Chorley has made as to approximate uniformity of
thod of teaching, I think deserves consideration.
freedom in this respect must be allowed to each
vidual professor, but mutual agreement as to
things is not unattainable. For instance, our
nomenclature might be made more consistent and
metrical; we might get rid of absurd expressions,
as "superfluous fourth," "extreme sharp sixth,"
So with regard to the names of notes. In France,

a great part of Italy, the syllables Do, Re, Mi, &c., are exclusively used, not only by musicians, but even by makers of instruments. In England, these syllables are used by some persons exclusively; by others, only in reference to singing, and used in half-a-dozen different methods. I think the Academy might do a great deal by a readjustment of these things, and by setting an example of uniformity in regard to them. The Academy should on no account take boarders, and should undertake nothing further than the musical instruction of the students. It might authorise or sanction boarding-houses for students whose relatives lived at a distance, and the principal ought to look after these.

898. Would you point out what you consider are the main differences between the system you have been so good as to sketch and the present constitution of the Royal Academy of Music?—I am really not sufficiently acquainted with the present working of the Academy to do this confidently; but, so far as I understand, there are many very considerable differences, one of the most important being that the professors of the existing Academy form no distinct or authorised body—have no share in the government of the institution. I have been told that the board of professors—so called—has several times been abruptly dissolved by a sort of *coup-d'état*. Then again, what I call the council—in the existing Academy, the board of directors—certainly did, during the time I was connected with the Academy, interfere very actively in matters of a professional kind; and I must say, I think greatly to its disadvantage.

899. You would, in any new constitution or new regulations, draw a broad line between what may be considered business management and professional management?—Decidedly. I would define the duties of either body very accurately. Of course there must be a court of final appeal.

900. But not on questions of music?—Only where there were irreconcilable differences of opinion among the professors.

901. Do you not agree with the evidence given by more than one witness as to the undesirability of compelling students to learn the pianoforte, especially singing pupils?—If the object of an Academy were to create a certain number of mechanics, and to secure a slavish and exclusive practice of one branch of industry by ignorance of every other, I should certainly agree with it. As I conceive the very reverse of this to be the case, and that it is the business of an Academy to educate its alumni as liberally as possible, I disagree with it entirely. It is hardly possible to study music well without some knowledge of the pianoforte; at all events the study of music is greatly facilitated by it.

902. Are you aware that the Royal Academy has notice to quit its present premises?—Yes; I have heard so.

903. Do you consider that is an eligible situation for such an institution?—Most ineligible.

904. Are you aware that the Academy some years ago made an application for a site of ground at Kensington?—Yes.

905. Should you think that an ineligible situation?—I think it would be a very eligible one on many accounts. In the first place, an Academy located there would be isolated from other houses, and pupils living in the neighbourhood of the institution might live on the country side of it, with the advantages of fresh air and perhaps less expense.

906. The Academy being obliged to quit its present premises at Midsummer, should you prefer that it should be carried on with the best temporary accommodation that could be provided, or would you suspend its operations during the period that must elapse in providing a suitable building?—I am disposed to think its existence had better be suspended for two or three years. I do not think that would be an evil.

907. You think there would be no difficulty in reviving public and parliamentary interest in the work?—I fear that public and parliamentary interest in the work will have rather to be created than revived, whether now or three years hence.

908. Would it not be rather hard to throw the pupils on the world and not continue their education as well as you could?—In the case of scholarships there would certainly be a difficulty.

909. So with the other pupils—if you have pupils of merit—would it not be hard not to continue their education; or would you provide for them in any other way?—It might be a difficult thing to do so.

910. If the Academy were suspended for three years, it would take as long a time to get into working order again; so that, practically, there would be a delay of five or six years?—I do not think that need be. There are two questions which we are canvassing: one is the carrying on of the present Academy under still more disadvantageous circumstances than at present exist; and the other is beginning upon a new principle entirely. If you could begin to-morrow upon a new principle, I would say by all means do so.

911. Reverting to the question of management, what would you consider to be the relation established between the board of professors and the principal? Should you be disposed to give him very large powers, in the way of control and management—not as to the teaching or the special instruments to be taught, but as to the proper performance of duties in the Academy?—Certainly. Having chosen a principal, I would give him very large but not unlimited powers. He should be absolute in respect to the regulation of the "time-table," and the distribution of pupils into classes; but I do not think he should interfere with the modes of operation of the professors. Indeed, first-rate men would never endure his doing so. I would guard against discrepant or inconsistent teaching, first, by agreement on general principles, and then by taking care not to elect a professor who could not adopt these.

911*a*. Even by temporary arrangements, and in a temporary building?—Yes.

912. Do you think there is more uniformity among the professors in foreign conservatoires in the modes of teaching and the theory of music than is to be found in our own institutions, and in the Royal Academy in particular?—I think that there is in France; but the French are more systematic, or more ready to adopt uniformity in everything; the professors work well together. At Leipsic, I am told, it is the reverse; and that there are great disagreements as to the modes of teaching there generally.

913. Do you consider it a disadvantage that such disagreements should exist?—A very great disadvantage, certainly, but one to which an academy is always liable.

913*a*. So that after all, the system of teaching must be more or less brought under the control of the principal?—Rather, perhaps, under that of the board of professors, as they could protest against the election of a man who would not be likely to work harmoniously with them. The prosperity of the Academy for many years to come—I would almost say for an indefinite period—would depend greatly on the selection of the first set of professors.

914. Do you think the election of professors should be with the board of professors, or that their nomination should be with the principal, and the confirmation with the board of directors?—The board of professors, one of whom—perhaps the chairman of which—the principal would be, should nominate the professors, subject to the veto of the board of directors, or council.

915. You would prefer that the responsibility of the management of the Academy in professional matters should be in the hand of the board of professors, instead of in the hands of the principal alone?—I do not think it should be in the hands of the principal alone. Inevitably, however, the influence of the principal would be very great indeed.

The Chairman stated that he wished to call the attention of Mr. Hullah to the results of a tabulated statement before him, from which it appeared that, at the present time there were in the Royal Academy, in the subject of harmony, 7 professors and 70 pupils; in the pianoforte, 12 professors and 64 pupils; in singing, 9 professors and 48 pupils; in the violin, 3 professors and 14 pupils;—showing that the work to be done by the professors is very disproportionate to the number of persons who receive the instruction. What was the security that the like result would not follow from giving a board of directors the origination, so to speak, of the professors?—The state of things you describe has come about by degrees. It is inconceivable that any body of directors should "originate" anything so absurd. The same causes would, no doubt, bring about the same results; but it is most improbable that the same causes should ever again come into operation.

915*a*. You do not object to a system which makes the responsibility for results as individual and close as possible?—Certainly not.

916. Have you any suggestions to offer to the Committee with respect to what the building should be to meet the requirements of an Academy?—Only in the merest outline. The first thing, of course, is a good concert-room—not too large—say 120 feet by 60; that is, about the size of St. Martin's Hall, with accommodation for an orchestra of 150 to 200 vocalists and instrumentalists.

917. How many persons would that accommodate, exclusive of the orchestra?—That depends upon how they are placed. We have had an audience of about 2,000 in St. Martin's Hall, but the seats were closely packed, and some hundreds were obliged to stand. A room of the size I have named would allow of comfortable seats for from 800 to 1,000 persons.

917*a*. The concert-room you contemplate would be more for practice than for performances?—I would have performances, as I have said already. But there is great advantage merely in practising in a room of such size. No safe estimate can be made of the power or even the quality of a voice in a small room. In addition to this, there should be a chamber concert-room for quartets, &c., capable of holding a moderate number of people. If instruction is to be given for the stage, there must be a small theatre for practice. They have a theatre at the Paris Conservatoire, which is also used as the *Salle des Concerts*, for which it is much too small. Then there would be required a lecture-room large enough to accommodate the whole of the students, with provision for display of experiments and the exhibition of diagrams; also a set of class-rooms, separated by thick walls; of course, a library; and, if possible, a museum of musical instruments; together with apartments for the principal and the lady superintendent. The library I regard as a most important feature of the institution. London is very deficient in this respect, and what there is is by no means easily accessible. I do not know, for instance, where at this moment I could see a complete set of scores of Haydn's symphonies—even of those which have been printed. The British Museum, as a library of reference, is worth little to the average student. It is, no doubt, rich in curiosities—as such a library ought to be—but the average student does not want curiosities.

918. Are you aware that the authorities of the British Museum have been making great endeavours to increase their stock of music, more particularly of the class you are speaking of?—I was not aware of it. At the same time, the proper place for a musical library would be such an institution as we are discussing. A museum of instruments is an old notion of mine, but it has never yet been realized here: every year's delay makes its formation more difficult. They have one at the Paris Conservatoire.

919. Are you aware that that collection was offered to the English Government before it was obtained by the French?—No; but I am not surprised to hear it.

919*a*. Do you know the collection made by the late Professor Donaldson at Edinburgh?—Quite well. It consists principally of apparatus for the exhibition of acoustic phenomena; and, in that respect, it is perhaps the most complete collection ever made. I believe a great many people would contribute to such a museum as we are contemplating.

920. Do you consider that useful relations might be established between the Royal Academy of Music and the various training schools throughout the country?—I think they would occasionally send students.

921. And also with military bands?—No doubt. That is a very important department of music. The proposed Academy would be the proper place for the education of bandmasters. At the present time much of the music for military bands is badly scored.

922. Are you aware that the bandmasters of the three regiments of Guards were pupils of the Academy?—I am very glad to hear it.

923. Have you formed any kind of estimate of what the probable expenditure of such an institution as you desire to see in this country would be?—I have not data enough to enable me to form more than an approximate estimate, but I should think, roughly speaking, about £10,000 a year.

924. You consider it would be necessary to pay the principal a good and sufficient salary?—As he must devote the whole of his time to the institution he would require to be well paid. I would not have him do anything out of the institution, but give it his whole time and attention.

925. You would like to see at the head of the institution a person of the professional standing of Auber or Cherubini?—It does not follow that the most accomplished composer would make the best principal of an Academy.

The committee then adjourned.

Nineteenth Ordinary Meeting.

Wednesday, April 18th, 1866; Professor Owen, F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Fraser, George C., 62, Tredegar-square, Bow, E.
Grist, Richard, Brimscombe, Gloucestershire.
Knatchbull, Wyndham, 3, Chesham-place, S.W.
Silvy, Camille, 38, Porchester-terrace, W.
Spence, Charles Stenson, Shannon-street, Marsh-lane, Leeds.
Tarner, A. Phythian, 3, Upper Baker-street, N.W.
Thorp, Henry, 27, Piccadilly, Manchester.
Ward, John, 13, Donegall-place, Belfast.

The following candidates were balloted for and duly elected members of the Society:—

Armstrong, Richard Baynes, King-street, Lancaster.
Ashbury, James, 27, Great George-street, S.W.
Austin, Stephen, Hertford.
Birley, Samuel, Ashford, Derbyshire.
Bryant, Wilberforce, Patent Safety Match Works, Fairfield, Bow, E.
Dutton, Francis S., F.R.G.S., Reform Club.
Fowler, Francis H., 32, Fleet-street, E.C.
Gossage, William, Widnes Soapery, near Warrington.
Gowland, G., 76, South Castle-street, Liverpool.
Holdsworth, Samuel, 54, Spencer-st., Clerkenwell, E.C.
Mander, Charles Benjamin, Varnish Works, Wolverhampton.
Middlemore, William, Holloway Head, Birmingham.
Patterson, W., jun., 2, Dover-place, Clifton, Bristol.
Penson, Richard Kyrke, Ferryside, Kidwelly.
Rowden, William T., Burrage-road Evening Class, Plumstead, S.E.
Rüst, R. A., 8, Argyll-street, Regent-street, W.
Watkins, Charles A., 10, Greek-street, Soho, W.
Wood, J. W., Custom House, Harwich.

The Paper read was—

'HE DISEASES OF MEAT AS AFFECTING THE HEALTH OF THE PEOPLE.

By J. L. W. Thudichum, Esq., M.D.

There has been from early times, and in most countries, general belief that the flesh of diseased animals was ijurious to the health of human beings partaking of it. t cannot be supposed that this belief originated in anyhing but actual experience, though it must be admitted hat of the exact nature of the experience we have no ecord. Like any other experience which does not esult in the deduction of a law, because of the want of any emonstration of the law of causation, the experience rearding the injurious effects of the eating of meat from disased animals was of a fallacious nature. A prediction ased upon it might be as easily falsified as fulfilled. Thus ie ideas even of intelligent legislators remained unefined or confused, and benevolent intentions were not irely perverted into heavy inflictions upon society. ome nations, finding beef injurious now and then, disontinued the use of it; others, suspecting pork, availed iemselves of the argument of the uncleanliness of the g for making its use as a meat an offence against ligion. Experience derived from diseased individual iimals was extended so as to apply to a whole species, id such ignorance effected a tyrannous generalisation. excluded one danger, but, at untold sacrifice to the otected; it left full scope to other agencies of the iture or existence of which it had no warning; it raised ifling and harmless anomalies to the dignity of danrous causes. Such conduct could not invite to imitaon, and remained limited to the range of its compulsory wer. It even grew more senseless by practice, until last it appeared to be, and was in fact, little else than superstition.

The progress of natural and medical science has in r day completely changed the aspect of this question. bservation and experiment have established distinctions t dreamed of by earlier philosophy. So much of the tual has been evolved and brought into the light of y, that there is no room in the human mind for the aginary. Uncertainty, where it exists in such a anner as to admit of apprehensions, is hedged round prudent measures; it is the object of ceaseless investiions, carried on by well-tried methods, with the aid great human inventions, such as microscopes and emical reagents. There result complete protection, least in the most important cases, for all those who ll take the trouble to know and to see; there result opositions for laws, or actual legal provisions, by which e state or the community undertakes to practice and force the protection offered by science. Science is ce more shown to be an essential factor of state and unicipal government; the human understanding is ce more encouraged to persist in inquiry upon all oblems.

Within our own time the science of zoology has larged its range. From what is termed a descriptive ience it has become an experimental discipline. To the mparative anatomy of animals there has been added eir physiology. That part of zoology in particular hich concerns most the subject of this evening has en extended until it has become a subject of the deepest ilosophical study. As such alone, the subject of meat rasites claims the attention of every educated person, en if it did not teach important lessons regarding the troduction of danger or discomfort to humanity. But hereas such a danger clear and well defined does exist, s exposition is the duty of all those who are called upon exercise their skill in the protection of the health of e public, and its consideration and avoidance the duty every responsible member of the community.

But we observe a still greater progress in the arena pathology and practical medicine than in the field of ology. The extension of anatomy by the microscopic method has vastly increased the range of human knowledge. When, thirty-four years ago, a little worm was discovered in human muscle, the world was in a state of sensation and wonder. Then the foundation was laid for that magnificent acquisition of medical science, the knowledge of the causation, progress, and prevention of that remarkable disease known under the name of *Trichiniasis*. That these 34 years were requisite for this remarkable development any one will admit who studies the single steps which led to our present knowledge. But what is most to the credit of the method which now prevails in medical science is the fact that the main bulk of our medical knowledge on *Trichiniasis* has been evolved, taught, controlled, and summarily entered upon the great record, all within the short space of three years. The imperfections of medicine are inherent in its nature, as a compound science based upon the knowledge of metaphysical, physical, chemical, and vital phenomena. And these difficulties on its own side are increased manyfold on the side of the objects upon which it has to be exercised. But the splendid manner in which the votaries of this science used the light, which originally struck by Owen (whom we are all proud to see presiding over us, and giving the countenance of his great name and dignity to our deliberations), and kindled by such men as Wood, Herbst, Leuckart, Virchow, and Zenker, for the illumination of some dark corners of human existence, for the elucidation of mysterious cases of illness, occurring singly or in batches, or in extensive and fatal epidemic outbreaks, this feat will ever demonstrate to the world that the medical profession appreciate the object of their calling, and are in possession of the means for doing it ample justice.

The scientific consideration of the entire subject of the diseases which man may contract from unwholesome or diseased meat was first begun as a part of that movement which is now known under the name of preventive medicine. That movement originated with, and was forced upon the attention of the people by, the medical profession, who thus manifestly preferred their morality to their secular advantage. The first connected consideration of the diseases of meat was, I believe, effected by Dr. Greenhow, incidental to an inquiry on the influence of food in general. When the sanitary laws, which have acted so beneficially in the metropolis and elsewhere, were at last introduced, the medical officers of health obtained at least a share of that influence and power which common sense demands should be exercised towards the removal of causes of disease. The most important meat markets at least were placed under their supervision. But constant abuses continuing in places where there were no medical officers, or where their authority proved insufficient, or where the magistrates interpreted the law in the same manner as the one who lately decided that ketchup or catsup was not human food, and might therefore lawfully and with impunity be prepared from putrid ox-livers, the agitation on the subject continued. The medical officer of the Privy Council, Mr. John Simon, caused an investigation to be instituted on the prevalence of diseases in cattle used for human food. With that investigation, which was intended to treat the subject from the veterinary point of view, Mr. John Gamgee was charged, and his report is contained in the Sixth Annual Report of the Medical Officer of the Privy Council. This report served as a basis for the proposal of some legal measures which Her Majesty's Government introduced into the House of Commons two years ago, under the title of the Cattle Diseases Prevention, and Cattle, &c., Importation Bills. The House appointed a committee, which, after inquiring into the whole subject, reported the first Bill with amendments to the House, but found it inexpedient to proceed with the second. As it was clearly shown there had been some exaggeration in the information upon which a part of the first Bill was founded, the Government judged it best to withdraw the Cattle Diseases Prevention Bill, and many

useful measures upon which everybody was agreed were thus left in abeyance, together with those which appeared to require further discussion and investigation. The Privy Council, under the advice of Mr. John Simon, meanwhile caused the inquiry on the diseases communicable to man by means of meat to be continued in that field where it appeared to offer an immediate practical advantage, and I had the honour of being entrusted with the investigation of the parasitic diseases of quadrupeds used for food, more particularly with those which were communicable to man. My report on the subject is contained in the 7th Annual Report of the Medical Officer of the Privy Council. In the course of my investigations I became convinced that the principal agency for the protection of the people from parasitic diseases would be the general diffusion of accurate information on the subject. I believe that the Council of this Society were guided by a similar consideration when they judged that the subject might prove of interest to an audience such as that which I have now the honour of addressing. Nobody will doubt that discussion clears the views and augments the knowledge even of the most accomplished; and thus, as we are united in intention, our discussion may contribute to clear the way for those protective legal measures which seem practicable, and do not involve unnecessary hardships to any one; while, on the other hand, we may evolve more distinctly the fact that on some important points connected with this question legislation is inexpedient, because the legal remedies which might be thought of are impracticable as regards execution.

By the abbreviation of "diseases of meat," which occurs in the title of this discourse, we have to understand diseased conditions of meat, or results of disease in the animals from which the meat has been taken. Such diseased conditions may be considered under three heads: First, Diseases of a specific nature, which can be transplanted upon man, so that the human subject becomes afflicted with the same disease as that which had hold of the animal when it died or was killed. There is only one disease known to science at present which can have that effect, namely, malignant pustule or anthrax. Now, although it is certain that there are a certain number of cases of this disease in which infection seems to have been brought into the body by mere contact with the hands or mouth of persons, and even by the ingestion of such meat into the stomach, yet these cases are very rare indeed; first, absolutely as cases of disease, and, secondly relatively as compared to the number of cases in which anthrax was inoculated into wounds or transplanted by the poisoned sting of flies. But even of these cases only very few actually occur in practice, so that from our present point of standing, considering as we do principally the diseased conditions of meat which are capable of influencing public health—that is the health of the masses—we can attribute no particular importance to the possible introduction of malignant pustule into the human subject by means of the meat of animals which have been affected with it. And this is the best opportunity for pointing out an important negative result of these inquiries on transmissible diseases, namely, that the so-called specific diseases of animals cannot, as a rule, be transplanted upon man, and those few which can be transplanted can only be so propagated by inoculation. Mere ordinary infection — such as would bring typhus from man to man—never causes the specific disease of an animal to appear in the human subject. Man cannot be infected with the cattle-plague, be it bovine typhus or bovine small pox; it causes him no typhus and no small-pox, even when he is inoculated with the cattle-plague matter. Man can be infected by inoculation with cow-pox, and is by that means protected against the small-pox peculiar to his species, but he cannot be infected by ordinary contagion. It is, in fact, a general law, that each species of animal has its own specific diseases, of which the germs are only reproduced by its species, and communicated from one individual to another of the same species. Species which are related so as to be capable of producing cross breeds may also have a certain liability to certain diseases, but the species to which the disease comes only secondarily, already modifies the type of the disease, so that it becomes less infectious, less severe, less dangerous, and in the end dies out. Indeed, if man were liable to take any of the specific febrile diseases of his domestic animals, he would now be more likely to be in course of being swept off the earth, or to have already disappeared, than to increase in numbers, fertility, and well-being, as in fact he is doing on many parts of the globe. Illustrating broadly, we might say, that if the beef we eat were derived from animals killed while under the influence of pleuro-pneumonia, or of foot and mouth disease, or of cattle-plague, and if our pork came from pigs killed while subject to the scarlet fever peculiar to the pig, we should, nevertheless, not be at all liable to be ourselves infected with this pleuro-pneumonia, this foot and mouth disease, this cattle-plague (indeed, on this last disease we have a large amount of evidence attesting the freedom of man), nor should we be at all liable to be infected by the pig with its scarlet fever. Neither could we infect these animals with our own numerous diseases, excepting the very few transmissible by inoculation, such as small-pox, which may be given to the cow and horse, remaining, however, small-pox, howsoever modified by the new species. As a rule, no species is infected by the specific diseases peculiar to another; in those few cases where it is otherwise, the infection has to take place through a wound, as in rabies, or hydrophobia. This law of nature is a necessity so self-evident as to require no further discussion, and no illustrations could mark it out more strongly by contrast than the late aberrations from its teaching, such as the floundering and illiterate statements about the identity of cattle-plague and human small-pox, or the oration lately delivered before the Medical Society of London, which had for its title "the unity of disease," and happily, as regards the credit of the science of medicine, a surgeon for its author.

In the second class of diseased conditions of meat we have therefore to place all those which, while produced by disease specific to the animal species, do not cause the same specific disease in man, nor any other disease specific to man; but either produce no disease at all, or, if producing a pathological effect, cause a process which stands to its cause in the relation of poison to poisoning, of arsenic to arsenical poisoning, but not in the relation in which typhus infection stands to typhus fever. I am fully convinced of the truth of the allegations which have repeatedly been made, that the use of pleuro-pneumonic beef, particularly in the form of sausages, or of steaks, both being frequently underdone, has caused symptoms and processes of severe indigestion. Vomiting, purging, cramps, collapse, and even death, in sixty similar cases, seem to have been thus produced. But in all these cases the evidence lacks that precision, in one particular part or other, which science has a right and an absolute necessity to demand. Thus in the sixty cases of illness from pleuro-pneumonic beef sausages, "muddled" pork fat, that is, pork fat in a state of semi-putridity, had been added, and the shares of the beef and the pork in the production of the illness could by no means be separated. At present medical science pronounces with Mr. Simon, the medical officer of the Privy Council, that we are not in possession of any evidence of injury to human health from the consumption of meat, in a cooked state, of animals having different epidemic diseases, such as pleuro-pneumonia, aphtha, and the steppe-murrain. Mr. Simon further says that if the statements made about the prevalence of pleuro-pneumonia be moderately or reasonably correct, all of us must every now and then be eating pleuro-pneumonic beef. Every now and then, on a particular day, a whole household would eat it, and then if the meat were capable of producing suddenly injurious effects, we should be having in the whole household, as it were, an out-

break of poisoning. We may further agree with Mr. Simon in allowing that the long-continued or large consumption of such beef may produce remote effects; but even this is not proved.

Just because the evidence relating to the effect of meat thus diseased is of the slenderest kind, it is necessary to assume an attitude of expectation, and to form a resolution for further observation and inquiry. All mankind loathes to eat of an animal which has died from the effects of disease. The objection to the consumption of diseased meat is much diminished by the ceremony of slaughtering, and perhaps there may be good grounds for this abatement of the objection in the fact of the blooding of the animal, whereby the main carrier of diseased action is probably removed. But even the proposition to eat of an animal thus slaughtered retains a part of the disgust with which mankind considers even fresh carrion. For myself I can say that I should not easily consent knowingly to eat meat from an animal which had been killed while under the influence of a febrile disease infectious to its species. The diseased condition effects an ideal taint perceptible to my aesthetical feeling, just as putridity effects a taint perceptible to my simpler senses. The effect of either is that insuperable objection called disgust, which I should always consider as a sufficient warning of coming injury, and which I am sure no fine feeling person will on argumentative grounds ever be able to disregard or subdue without sensible consequences of a disagreeable nature. Therefore, if very many of us possessed the cheerful disposition of those inquirers who lately made hearty meals upon cattle-plagued ox hearts and sheep's hearts, and pork cutlets infected with the bags of psorosperms, they might perhaps raise no objection to the sale of cattle plague beef, &c., and experience as little sensation as was produced by the above dining experiments. But those whom nature has made of finer stuff might reasonably demand to have a choice in the matter, and to be able to select their meat as nearly healthy as can be. On the whole, I think it a reasonable proposition that all meat upon which the evidences of disease can be discerned should be condemned, and that all meat coming from diseased animals, if allowed to be sold at all, should be caused to be offered as such in the market, although it be of ordinary appearance. But the practical difficulties in carrying out any such idea are so enormous, that I have little hope of relieving even my own disgust for pleuro-pneumonic, or otherwise diseased meat, by any other agency than that which is imputed by a libellous invention of man to that sagacious bird, the ostrich, namely, the affectation of ignorance. I will ignore objectionable practices, which I have seen in slaughter-houses with my own eyes, because I am on the other hand convinced, from frequent inspection of our principal London meat markets, that by far the larger quantity of all meat offered for sale is of good or useful quality and healthy, and for the rest I will, in common with others, keep a sharp look out to collect data towards the decision of points which our present knowledge leaves in doubt or obscurity.

In his evidence before the Committee of the House of Commons in 1864, Mr. Simon also said that, in his opinion, a good many of the cases of injury to health which had been published, and supposed to be from diseased meat, had really been injury to health from meat in particular stages of putridity. That had been especially the case with veal, and perhaps also with pork. These kinds of meats seemed liable, under some circumstances, to a peculiar kind of putrefaction, in which they need not be flagrantly offensive. If eaten in that state they injured considerably, or perhaps killed. A similar process of modified putrefaction has been observed in venison, in the bodies of hunted animals, and in animals which died a slow and torturing death in nets or traps. Liebig relates an important case of the latter kind in his "Chemical Letters," and a case of severe illness caused to several members of a family, as also to their cat, by a meal of Canadian partridges, was, a few years ago, credibly related to me. All these and similar cases and orders of cases have to be closely considered in an investigation of this kind, although we must admit that they are rare, few and far between.

The third class of diseases communicable to man by means of the flesh of animals are those which are caused by entozoa, and hence are called parasitic diseases. They are diseases as specific in their nature as any other human diseases, and obey natural laws of causation and transmission with the greatest fidelity. But they have this peculiarity, that they exist by means of a curious reciprocity between different species of animals, more particularly the calf, ox and cow, and the pig, and also, though only indirectly, and through the instrumentality of the dog, the sheep, on the one side, and man on the other. In other countries man keeps up a reciprocity with certain kinds of fish, and in very rare cases with molluscs, with which cows and sheep carry on a lively trade in parasites. From his veal and beef man derives the great hookless tapeworm, the most troublesome and obstinate animal of that shape; from his pork he gets the common hooked tapeworm; giving in his turn to both calves and pigs the germs of the entozoa which nestle in the flesh, and become again larvæ of future parasites; from the sheep and ox he derives, through the instrumentality of the dog, the germs of that painful and frequently fatal disease termed echinococcus or cystic disease; from the pig, lastly, he gets that awful scourge which we now know by the name of trichiniasis. We will illustrate the various parts of the history of these diseases, and of the agents concerned in them, a little more in detail, and exhibit the agents themselves, on a colossal scale, by means of the oxy-hydrogen microscope, on the white screen on the wall before you.

There is in this glass a piece of veal, which, while it was fresh, presented no particular appearance to ordinary observation. On close inspection, however, a small cavity could be here and there discerned, and in it a little bladder. When we carefully removed such little bladder and placed it under the microscope, we perceived that it was organised, and was in fact a bladder-worm, with its head and neck inverted inside the cyst. You here see the bladder-worm, or bladder-tail, cysticercus. [A microscopic picture No. 1. was thrown upon a large white screen.] You perceive a round bladder, with an aperture on one side which leads to the cavity of the involuted head. The neck and head are covered with calcareous corpuscles, each of which is clearly depicted. There are four large sucking disks distinguishable, and between them a fifth smaller one. No hooks are perceptible. Here in the corner of the field is an everted head, and the bladder in which it was inverted is destroyed. Now if any person were to eat such veal in a raw or underdone condition, he would very likely after a month or so find himself inhabited by a large taenia, which, in about three or four months, would give him considerable trouble, and cause him no mean symptoms of illness, ranging from sickness to epilepsy. You see here the head and neck of this taenia. [It—No. 2—was shown upon the screen.] You perceive the same character of head as in the bladder-worm, four large suckers and a small one between them, and much pigment all around. This was evidently a very powerful animal, and perhaps seven or eight years of age. It is the most obstinate human taenia, and can but rarely be expelled by medical means together with the head. Mostly the head remains behind, and soon grows a new chain. It reaches an extraordinary length, amounting to 10 and 12 feet. Here is a portion of the body of such a worm, amounting to three links. [The microscopic picture No. 3 was thrown upon the screen.] You perceive the egg-holders, all filled with ripe eggs, say 50,000 in each link. The excretory vessels are injected with mercury. You perceive that they form two longitudinal canals, which run along the entire animal, and at the

end of each link are united by a cross canal. At the junctions are beautifully fitted valves, which prevent the recurrence of any fluid towards the head; the vessels can therefore be injected only from the head towards the ripe end, and not in the reverse direction. The position of these canals is shown upon these transverse sections, (microscopic view No. 4 shown upon the screen), which also show some portions of the internal arrangement of the animal; the skin, the contractile layer or muscular system, and the egg-holders full of eggs. Like most taeniæ, this species possesses no alimentary canal, but lives by absorption of nutriment through its skin. This skin is thickly studded with oval corpuscles of carbonate of lime. This, then, is the great hookless human taenia, or *Taenia grandis*, sometimes also termed *saginata*, the fat or sleek taenia, and *mediocanellata*, a denomination which, as being based upon an error, should be abandoned. The cycle of the life of the taenia grandis, then, is completed in three animals. The first animal, a man, harbours a taenia, which produces from 6 to 8 ripe links or proglottids per day, containing, therefore, from 300,000 to 400,000 ripe eggs. The second animal, a calf, eats a number of these eggs, with the grass or fodder, whereupon the embryos, already contained in these eggs, and armed with six sharp prongs each, creep out of the shells, penetrate the intestines, get into the bloodvessels, and travel all over the body of the calf, which thereby is made very ill, and sometimes dies. Ultimately the embryos settle in the muscles, and become the bladderworms of veal which you have seen. These, then, are again transformed into taeniæ in the bodies of people who eat raw or underdone veal or beef.* This succession of stages is a natural law, a specific parasitism; it cannot be altered; the ripe taeniæ cannot live in the calf's intestine, and the embryos cannot migrate and become developed in the human muscles. The calf alone rears the bladderworm in its flesh, and man alone rears the taenia in his digestive organs.

We come now to the second important taenia which man derives from diseased meat, namely, the taenia solium, or common hooked tapeworm. This is contracted by the consumption of pork containing the bladderworm or larva, from which pork, as it has a speckled appearance when it contains many of these animals, is called measly. You here see such a bladderworm, or *Cysticercus cellulosæ* on the screen. (View No. 5 was exhibited.) But, instead of taking a bladdertail from pork, I have selected one from a human liver in an early stage, to illustrate at once the important peculiarity of this species of animal, namely, that it can live in man as embryo, bladderworm, and ripe taenia, and in one subject complete two-thirds of the circle of its life. But in the pig it can only live as bladderworm, and not as ripe taenia. Thus, as regards this taenia, man has a prerogative above the pig. Now let us look at the taenia which is developed when the bladderworm, the measle, is eaten in raw or underdone pork. (Microscopic view No. 6 shown.) Here you see its head, with four suckers, a snout, and a ring of sharp hooks, which it uses like anchors for fastening itself in the tissues of the mucous membrane. Whenever I see this colossal picture I am reminded of the line in Goethe's poem "Mignon:"—"In Höhlen wohnt des Drachen alte Brut!" (In caverns dwells the dragon's ancient breed.) Of the power of these animals you can form a conception from the following specimen. (View No. 7.) Here you see again the head and forepart of the taenia, but its hooks are imbedded in a portion of the mucous membrane. The power of the excited intestine could not overcome the power of the worm's claws, but they had to be torn out of the mucous membrane together with the piece in which they were fastened. A worm so imbedded can occasionally be lifted up entire, and pulled like a string, without yielding its hold; to comprehend the nature of these animals one must have studied them active and strong, pliable and warm as they come from the intestines of freshly killed animals. There is a third head (view No. 8) upon which the rostellum or snout, and the position of the hooks with regard to the snout, are more clearly perceived. I will now show you a piece of the body of taenia solium (view No. 9). Here are two links made transparent by artificial means. You see the egg-holder with its tree-like branches full of eggs. Here you see numerous other glands, which lead to this coil, or curl, called cirrhus, and out of the lateral aperture. These show that each link is an hermaphrodite creature. At the margins you perceive the excretory or water-vessels. I have made these water-vessels and the egg-holders more distinct in this specimen (view No. 10), in which they are both injected with mercury. And in the next specimen I have adopted another means of making internal organs visible at an early stage of development (view No. 11). I have dyed some links with carmine and made them transparent, and can now distinguish this triangular or germinal gland, and many minutiæ, which are of importance in generical course of study, but are here only brought forward to give you an idea of a few of the means by which all these cur[illegible] and remarkable facts are ascertained.

The cysticercus occurs in man sometimes in [illegible] brain, and then mostly causes death. It is [illegible] rarely observed in the eye, and is successfully ext[illegible]ted by oculists. Sometimes it causes tumours un[illegible] the skin, and sometimes, as in the case already gi[illegible] it is in great numbers in the liver. In these respect[illegible] imitates other taeniae, which inhabit these places wi[illegible] kind of preference, or with exclusiveness. We there[illegible]fore learn much by the comparison of the life of [illegible] taenia with that of another kind. Thus, as an illustrati[illegible] I will show you a few parts of the taenia, which, as t[illegible] diving bladderworm, lives and frequently occurs in [illegible] sheep. The ripe taenia lives in the dog, and can e[illegible] be produced by giving the dog bladderworms to eat. W[illegible] here is the head of this taenia (View No. 12), and t[illegible] rings of hooks, seen like a basket. The taenia itself [illegible] very like the *T. solium*, though shorter and smaller. [illegible] here are some of its last links, which it would be diffic[illegible] to distinguish from links of the human taenia. Inde[illegible] these taeniæ were often confounded before their relati[illegible] developments were known. Now please observe [illegible] character of these three separate animals, for such t[illegible] now are, moving and living alone and detached from [illegible] chain on which they lived and grew. (View No. 1[illegible] This first proglottid does yet contain some eggs. Th[illegible] second one (View No. 14) you see contains very f[illegible] and this third one (View No. 15) does not contain [illegible] eggs at all. They are all expelled. Living and acti[illegible] as this animal was when I found it, it was preparing [illegible] leave the body that had given the place, warmth, [illegible] food for its development. It had fulfilled, to the [illegible] end, its entire mission, and now decrepid and sex[illegible] prepared to make room for younger generations.

I mentioned just now that the cysticercus of [illegible] *T. solium* could become developed in the human b[illegible] This induces me incidentally to allude to a bladderw[illegible] which lives almost exclusively in the brain of ani[illegible] particularly sheep, more rarely horses. In sheep [illegible] causes the well-known disease called gid, sturdy, [illegible] turning sickness. I here show you such a bladd[illegible] which I have taken from a sheep's brain. (View No. [illegible]

* This transformation, originally discovered experimentally by Leuckart, has been lately confirmed in this country by experiments made at the Royal Veterinary College by Professor Symonds and Dr. T. S. Cobbold (the author of the well-known treatise on Entozoa), under the auspices of the British Association for the Advancement of Science. An account of some of these experiments has been given by these inquiries in the proceedings of the Royal Society. Dr. Cobbold has informed me that the bladder-worms in their second calf had, after one year and some months, during which time the animal had been kept at the Veterinary College and become a heifer, on the killing of the animal a week ago, been found dead and calcified, so that he and his collaborator saw no objection to selling the meat for human food, and so disposed of it.

was shown upon the screen.) You see that one bladder contains many hundred inverted taenia heads; each of these is capable, when eaten by a dog, to grow into a tapeworm, the taenia coenurus. Here (View No. 17) is a head of this bladder which I have everted, and which will give you an idea of the appearance of this taenia, which lives exclusively in the dog. Thus we have already made the acquaintance of two kinds of parasites which complete their circle of life between sheep and dog, but never affect man. But the next taenia which I must mention, although completing its circle between cattle generally and the dog, can also complete its circle of life between man and the dog, man taking the place of cattle, as in the case of the cysticercus cellulosæ we have seen him develop the peculiar capabilities of the pig. Now, as this form of bladderworm (View 18, Echinococcus) which affects man is relatively one of the most frequent and incurable parasitic diseases, it is important that people should have accurate knowledge on its life and mode of propagation, in order to be able to protect themselves, and particularly their children, from it. In his evidence before the Parliamentary Committee on the Cattle Diseases Prevention, &c., Bill, given in May, 1864, a well-known physician committed himself to the following statement. (See "Report of Select Committee," &c., p. 58.)

1277. Is there any other parasitic disorder derived from consuming diseased meat upon which you can give us any information?—One such disorder, which is more common than is usually supposed, is a large tumour in the liver, called cyst of the liver.

1278. What is the meaning of the word "cyst?"—It is the Greek for bladder; a bladder containing a large quantity of liquid. These bladders are really a stage in one development of a kind of tapeworm.

1279. It is a parasite in the body?—Yes; and I have known it produced by the eating of underdone pork.

1280. These cases came under your own observation?—Yes; I observed one case of two sisters in a family.

1281. How did you trace that to the consumption of underdone pork?—Eating raw pork is a thing which few do, and which still fewer would confess; but in the case of these two sisters I put what lawyers would call leading questions, and they both confessed that they had been in the habit of eating raw pork.

1282. Mr. Cox: Underdone pork?—No, raw pork.

It is a great pity that this sort of information should be styled evidence, for the only evidence in the case is that of the want of information on the part of the gentleman who gave it. Cystic disease of the liver, or *echinococcus*, the bladder-worm whose internal heads you now see on the screen, cannot be communicated to man or animal by the eating of diseased meat. The infection is carried thus:—The dog devours the *cysts* or bladders containing these heads; each head grows in its intestine into a very minute tapeworm, of only five joints; in this way a dog may harbour hundreds, nay thousands of these little creatures. They drop their last joints, and then their eggs, and both joints and eggs leave the dog's intestines. Now if these eggs are swallowed by a child, or a lamb, or a calf or a young pig, they become developed into embryos, which penetrate into all parts of the body, and settle and grow where they find it most convenient. Their prolific nature and longevity make them ugly customers, for they produce an infinity of heads, which grow all the year round like figs on a tree in summer time. Then they produce secondary, tertiary, and many more generations of bladders, one within the other, or by the side of the other, until a tumour, from the size of a fist to that of a man's head, and weighing up to 40 and 50lbs., is produced. Then the poor patients come and want relief at any price. Or the ox, sheep, or whatever animal it may be, has to be killed on account of incurable sickness. Of course the dogs again get the offal from the animals, and thus this dire disease is perpetuated. It is thus clear that every organ of an animal containing these *echinococcus* bladders is an indirect danger to the community, and should be seized and destroyed, and never be allowed to be eaten by dogs. And the 600,000 dogs running riot in this country as well as in others should be watched, cleansed, fed, and kept in-doors; or diminished in number by a wholesome tax vigorously enforced. Sometime ago an eminent statesman, with whom I was conversing on the loss of life from hydrophobia, said to me that legislation on dogs was impossible in this country. But I was not so sure that some improvement might not be expected from the increased knowledge of the people and a reformed House of Commons. The most dangerous bladder-worms of man and his domestic animals all came from the taeniæ of the dog. We might admire the arrangements of nature, but, nevertheless, endeavour their correction, just as we exterminated wolves, vipers, and vermin of all sorts. But I granted that legislation on this and other sanitary matters would not be so successful as it might be until this country possessed a Ministry of Public Health, Public Education, and Agriculture.

However, we must admit that in the interval these matters are not altogether neglected either by science or the authority of the state. But not to interrupt your entertainment longer by argument, however germane to the question, I proceed to give you a few further illustrations of the nature of parasitic diseases, which man receives through his meat.

There is an entozoon peculiar to Switzerland, particularly its lake districts, which is probably communicated through fish. (View 19. Body of *botriocephalus*.) It is also observed in the south of France and in Finland. Its juvenile condition is, however, yet wrapped up in mystery. Meantime you here perceive the structure of a piece of the ripe animal. Man also, in rare instances, harbours a parasite which chooses the gall-ducts of the liver as his residence, and he probably obtains the young animals from mollusks accidentally eaten. But the true home of this animal, which is a social creature, is the liver of the ox and sheep. (View 20. *Distomum hepaticum*.) There in the market you may buy a hundred livers and find flukes or flounders in each of them. Here (View 21. Intestine of *distomum*) you see still more of the organisation of this animal than in the first specimen. And to show you that parasites exercise a very remarkable choice as to the organs of the animals in which they live, I here exhibit to you a threadworm, or *strongylus filaria* (View 22), which lives in the windpipe and lungs of cattle, particularly lambs, and suffocates them in great numbers. This specimen comes from a victim of an epidemic which occurred last autumn in Lincolnshire. This *pentastomum* (View 23) lived in the human liver, and its parents in the nose of a dog. Here is such a mother of a family. It is not a true entozoon, but a hybrid between entozoa and epizoa, a transition from class to class. Is is an arachnide, like the acari, the itch and mange-mites, and those remarkable mites which a few years ago appeared at St. Peter's Church, Colchester, and drove congregation, churchwardens, and clergy out of the building. In commemoration of the event, I gave to the mite which I had discovered in the human skin years ago the new name of *Sarcoptes sacrilega*. The *pentastomum* is such a *sarcoptes*. While young its meat is human or rabbit's liver, but later it lives upon inflammatory products which its presence causes to be secreted in the nasal cavity of the unfortunate dog which happened to smell at rabbit's offal. Thus nearly all the organs of the body have their occupants; there remain but the muscles, a third of the weight of the body, to receive a peculiar tenant, whose acquaintance we have not yet made this evening.

This peculiar tenant of the muscular tissue is the flesh-worm, or *Trichina spiralis*. Here is a piece of human muscle, a glance at which will best explain the appearance which first drew attention to this subject. White specks, of calcareous hardness, disseminated all over the muscle, blunted the dissecting student's knives, and we

know now from the testimony of many persons that they have seen those specks and had their knives blunted as long ago as 1812, 1820, 1828, and later. But nobody thought or said anything about those calcareous specks or capsules before Mr. Hilton, of Guy's Hospital, who published a notice concerning a case which had occurred in the dissecting-room, where he taught as demonstrator of anatomy. He believed them to be minute cysticerci, a surmise which was less distant from the mark than that of the late Dr. Babington, who endeavoured to see whether they were not encapsuled maggots or larvæ of flies. It was not until these capsules came under the scrutiny of our honoured chairman, Professor Owen, that their true nature was directly and clearly evolved. Each capsule was found to contain a worm, which could be evicted from the capsule, and be observed to move. Seldom has a discovery in natural history created such a sensation throughout the civilised world as this discovery of the trichina spiralis by Richard Owen. And I may add that seldom has a discovery in natural science led to such important consequences for the safety and well-being of a great portion of mankind. You see here (View No. 25) trichina-capsules, imbedded in human muscle, in the state in which they are frequently met with. Here is a specimen (View No. 25) of trichinous capsules from a German who died in London about a fortnight ago. These capsules are the thickest I have ever seen, and as the case is very remarkable and teaches some new points on the longevity and importation of the trichina, I will give you an account of it.

On March 26th last a manufacturer of Bow, a German by birth, W. R. Bischoff, aged 58 years, was driving his cart in Whitechapel, when his companion perceived him suddenly to be seized with a kind of fit, and immediately after to be precipitated from the cart on to the pavement. He fractured his skull, and died on the 27th, at the London Hospital, of compression of the brain by blood. The *post-mortem* examination was made the same evening, and on the muscles of the cranium being incised, they were found to be full of trichina capsules. The muscular system was now carefully examined, and found everywhere to be thickly dotted with these formations. The mucous membrane under the tongue was examined, and it was observed that the cysts could be clearly perceived through the inviolate membrane. The cysts were found in all the voluntary muscles, and were as frequent in the muscles of the plantar surface of the foot as anywhere else. In all the muscles the number of cysts was greatest towards and near to the tendinous insertions. I have here a mounted specimen of one of the muscles in front of the neck, which will illustrate that remarkable appearance. The capsules were white, hard, and very thick. They broke only under great pressure, and blunted the edges of my anatomical scalpel very easily. Their tenants had been believed to be dead, but I evicted a number of them at the London Hospital, in the presence of Dr. F. Morell Mackenzie, who had been kind enough to draw my attention to the case.

They were living, well-shaped trichinæ, which moved readily while warm. The number of these worms contained in the body of this man I estimated at about 40,000,000. A microscopic specimen of the flesh would frequently show upwards of fifty of these capsules, and there were parts where the muscle seemed to consist of almost nothing but such capsules.

I paid a visit to the widow of the unfortunate man, and learned from her—an Englishwoman,—that her late husband had been born at Bremen, but had lived in England since his twentieth year. She had been married to him thirty-five years, and during that time he had never been away from London. About thirty years ago he had "rheumatic fever," which was very painful, and laid him up for some time. But ever since he had been in good health, with the exception of some indisposition about thirteen years ago, said to have been caused by losses in trade, and which did not confine him to his bed. He had during the last seventeen years been a member of a sick-fund club, but never required its assistance. He used to eat raw German sausages, and consumed the last one on the Friday before his death. All the sausages he ate were imported. Latterly his hands had been trembling, he had often complained of being unusually cold, and his friends had thought that he was breaking up.

Here, then, we have a case of trichiniasis, with an enormous number of parasites, and yet no later record of any corresponding disease than the rheumatic fever thirty years ago. From my personal experience in upwards of a hundred cases of trichiniasis, I find it quite impossible that the immigration of these trichinæ could have taken place without concurrent very severe symptoms. One might think of small infections repeated at intervals, but there are no data whatever to support such an hypothesis. Enough, I soon came to the conclusion that these trichinæ were thirty years old, and that the "rheumatic fever" which the man had thirty years ago, was actually the acute attack of trichiniasis, the disease caused by the immigration of the parasites which I now beheld in the muscles and capsules.

I instituted some experiments upon animals, particularly old and half-grown rabbits, dogs, and rats. They were given some of the trichinous flesh at intervals, and some of the rabbits were then killed and the contents of their intestines examined microscopically. I was assisted in the search by Mr. Norman, the well-known microscopic artist, but not a single intestinal trichina was met with. The capsules and trichinæ in them were entirely digested. In one case—a half-grown rabbit—I so arranged the experiment as to be able to examine the intestines at various stages of the digestion of the trichinous flesh. Some flesh yet in the stomach had already lost all the capsules and trichinæ, although the muscular fibres, and their arrangements, with hollow spaces between them, were yet perceptible. In one rat a very few trichinæ were found, partially advanced in sexual development. This experiment is not yet complete, as some animals still remain to be examined. But, with the exception of one dog, they have shown no symptoms; I therefore conclude meanwhile with the reservation implied by these pending experiments, that most of these trichinæ in the thick capsules were so old as to have lost their ordinary power of resisting the chemistry of digestion and *a fortiori* their power of propagation.

Thus far, then, this remarkable case teaches, 1st. The probability that trichinæ can be imported in raw German sausages and cause trichiniasis in this country. 2nd. That muscular encapsuled trichinæ may live thirty years; but that 3rd. If strongly encapsuled, they are, though living unquestionably, (the fact was specially ascertained at every feeding experiment), yet in most cases unable to withstand the powers of the stomach of various animals, and, consequently, but little capable of infecting these animals with new trichinæ. This feature is the first offset, so to speak, in favour of the species of animals on which the trichina preys. Most other circumstances of the life of animals and man, excepting only cooking, are greatly in favour of the success of the flesh-worm.

Ordinarily, when encapsuled trichinæ are eaten by man or animal, the capsules are digested, and the trichinæ set free. They now pass into the intestines, and there propagate themselves very quickly. Each female produces about one thousand young trichinæ in the course of a fortnight, and ushers them into the world alive, and quite prepared to eat their way to their final destination. Here (microscopic view No. 26) you see a number of ripe female trichinæ. On close inspection you can distinguish the ovary in the posterior part, and then the uterus with horse-shoe-shaped incipient monsters. Here you see them crowded, and evidently anxious to be separated from their mother. The male

trichina is only two-thirds the length of the female, but at its posterior extremity is ornamented with two horn-like prolongations. There is one male to about three or four, and sometimes more, females, so that for the trichinæ polygamy is a law of nature.

The young trichinæ immediately pierce the intestinal walls, and obtain access to all the tissues of the abdomen. The greater number penetrate directly into the blood-vessels, or indirectly into them through the lymphatics, entering the circulation with the chyle. A few get also into the abdominal cavity, and remain there or go further. On the seventh day after an animal has taken trichinous meat, the young trichinæ are found in all the tissues. It was believed that they get there by a process of boring in lines as straight as the crow flies. But in my researches upon upwards of one hundred animals, I have clearly shown that this view of the migration of the young trichinæ is untenable, and that they are distributed by means of the blood-vessels. In every capillary system some foolish young trichinæ think that they had reached their destination, the flesh. They consequently penetrate the walls of the blood-vessels, but when they are on the other side they are undeceived. The liver does not much arrest them, as there the passages are wide. But in the lungs many make the mistake of passing into the pleural cavity, and these mostly perish. The majority, however, get into the arterial blood. Some immediately go into the heart, but the heart does not allow them to remain; they are knocked about so much, and have so many stones, in the shape of nuclei of the sarcolemma, thrown at them, that they one and all quit the heart, and mostly die in the pericardial cavity. Then some ascend to the brain, and make it very restless. But brain is not food for them, and again they die. And so on with every tissue except the cross-striped muscles, which are subject to the will,—the actual red flesh. In that the trichinæ reach their destination. As the arterial blood is distributed all over the body, the trichinæ reach all the voluntary muscles without exception. They penetrate into them, lastly into the elementary single contractile fibre, and then their greatest ravages begin. They eat the contractile contents of these fibres away; these contents lose their mechanical arrangements and their contractility, and are transformed into bags of soft granular detritus. Of this detritus they now eat for about three weeks, perhaps attacking and destroying during that time several muscular fibres each, and grow to their full size. Then they coil themselves up spirally, being before straight and outstretched, and pass into a kind of trance or pupa state. The sarcolemma or sheath in which the contractile matter of the fibre was contained before the trichina ate it, now throws out exudation matter, which encloses the trichina on all sides, as the white of an egg encloses the yolk. This matter is firm at first, but becomes soft afterwards, ultimately a thin fluid, perhaps because the trichinæ use it as food, and replace it by excretory matter. The membrane further throws out many nuclei, which are particularly numerous at each end. Ultimately the sheath collapses in all parts, except where the trichina lies, and now that remarkable phenomenon, the encysted trichina, in an oval or lemon-shaped capsule, with a knob at each end, and a tapering parcel of fat projecting from each extremity, is completed. Calcareous matter, mostly carbonate, now encrusts the membrane, and this crust makes the capsules appear to the naked eye as white bodies; to the eye looking through the microscope, however, as black impenetrable masses. Mostly this calcification takes place at a late period, and the more lime is around a trichina, the older we may judge it to be. In this rabbit, however (the living rabbit was exhibited), the course of encrustation has been different. Ten weeks after immigration, which took place upwards of two years ago, the capsules were calcified and black, but now they are mostly quite transparent and soft, so that the trichinæ can with ease be seen inside them, and can be perceived to move within the capsules. I shall exhibit to you this phenomenon a little later. Now we will look over a variety of muscular encapsuled trichinæ, and I will explain the figures by running comments. Here trichinæ from the masseters or jaw-muscles of a rabbit, which died from tetanic trismus, or closure of the jaw. (View No. 27.) The live rabbit which you have seen also had this same symptom, explained by what you see, and had to be fed for a long time with milk and rice flour, which was injected daily into its stomach with a tube. Here are some further illustrations, each elucidating a separate point. (Views No. 28 to 35 were shown.) We must now consider the disease caused in man, by which the fact that he has eaten some trichinæ can be recognised. You know that there have been in Germany a great number of epidemic outbreaks of this disease. This circumstance gave a great many opportunities for observation, and I availed myself of some of them to go in person and study the disease on the human subject. Thus I observed most of the severe cases of the epidemic at Stassfurt, Prussia, which affected upwards of 300 persons. From some of the earliest cases, which were already in the stage of incapsulation, I excised a few slices of muscle from the arm, an operation which I twice performed at the desire of the patients themselves. Here is a preparation from the arm of an intelligent man, C. Oertel, who was curious and almost delighted to see his own disagreeable lodgers under the microscope. (View No. 36. Trichina from the arm of C. Oertel, of Stassfurt.) I also saw many cases of the Dessau epidemic, and some remnants from former outbreaks. As I had studied the disease upon pigs, rabbits, dogs, and rats, I was not a little struck with this curious result of my comparison of the disease in animals with that in man,, namely, that the symptoms observed in a great number of animals, when considered altogether or fused into one case, represent and imitate all the symptoms of the severest form of trichiniasis as observed in man.

Now for a summary description of these symptoms, as they come before the physician, beginning with the severest cases. The physician is called to see a patient, may be at night, who has been seized with cholera. He finds him vomiting, purging, with great pain in the stomach, and collapse. All remedies notwithstanding, the symptoms continue, and on the second or third day the patient dies. Now let us keep up the account of an imaginary epidemic. Perhaps the same night other cases turn up, of a similar nature to the first, but the patients survive the first shock. They then are seized with a very quick pulse, and complete sleeplessness, and with stiffness and pain in all the muscles, particularly the arms. Now the appearances become those of incipient rheumatic fever. Wood's case, and the German's case in Whitechapel, illustrate what no doubt has been a mistake which in former years has been often committed. But a little rigour in the diagnosis will now easily distinguish the fleshworm disease. Here the muscles themselves are painful and swelled, but not the joints or their neighbourhood, as in rheumatic fever. About the seventh day other symptoms supervene, particularly swelling of the face. Now, also, a number of cases present themselves, milder in type, where there is swelling of face and stiffness of limbs, but the patients can yet go about, though unfit for work. A few cases are observed where there is no pain throughout the course of the illness, but great prostration of strength, enormous appetite, and constipation. Some cases walk like persons in a fit of chorea or St. Vitus's dance. Prof. Zenke, in a letter to me, mentioned that the Indian disease, bexiberi, might perhaps be a form of such trichiniasis, a question which Indian practitioners should investigate. The severe cases now enter upon another stage—that of the signs of immigration. They cannot move a limb; all muscles are swelled, hard, stiff like boards, and painful. They are sleepless, and, if they can utter sounds, they lament

day and night, in a condition of helplessness and suffering which beats all attempts at description. The dropsy then becomes enormous; there ensue effusions into the cavities; breathing being almost suppressed through the lesion of the respiratory muscles; a host of dangers and discomforts ensue. Then a form of pneumonia or inflammation of the lungs arises, at the end of the third week, which kills many. Pleuritis, with effusion into the chest, also takes place; abscesses form; the projecting parts of the body are covered with great bed-sores, and no remedy whatever has any effect. The doctor can only stand by and observe a remarkable piece of natural history. If the patient gets over this period and into that of complete incapsulation he has a better chance. Few die after the twenty-eighth day from the beginning. A very few, however, drag on particular symptoms, and succumb after weeks and months' of miserable suffering.

The outbreaks of trichiniasis differ much in severity. Thus at Stassfurt, out of 300 cases, only five died; at Hettstädt, 28 out of 158 died; many were invalided; but at Hedersleben, 108 persons out of 360, who were seized, died, being a mortality greater than that of any other epidemic or endemic disease.

The study of this disease is very interesting also from a general pathological point of view, because it illustrates many parts of the laws of the localisation of disease. I might entertain you a little longer on this subject, but should fear to become too exclusively medical, and will therefore pass to the consideration of the origin of the trichinæ, and the means by which they may be prevented from infecting our pigs, and, through them, ourselves.

The fleshworm naturally lives and completes its cycle of life in carnivorous and *a fortiori* in omnivorous animals. Mice, rats, hedgehogs, badgers, foxes, cats, and martins have been observed to harbour these parasites. From one or other of them the pig therefore may obtain its fleshworms, by eating a portion at least of the dead body of an animal so affected. The beet-root origin of the trichinæ, lately trumpeted forth by *Galignani's Messenger*, and often repeated by the press of this country, is a mere fable. You may continue to feed pigs upon raw beet-root. The fleshworm, as I have called it, lives in flesh and in flesh only; it does not live in fat or in brain, or in the liver or kidney.

Now in order that a man may be infected with trichinæ, it is necessary for him to eat a piece of trichinous flesh in a raw or uncooked state. Practically the only course from which in the course of nature man gets his trichinæ is the pig. Therefore, a man only becomes trichinous by eating raw pork. Indeed, the greater number of infections, particularly the severe ones, are caused by this objectionable habit. Fewer cases are due to the incautious habit of eating pork, or sausages, or cutlets, or boiled pork, or minced and fried pork in an underdone state. It is proved by numerous experiments, that the trichina is entirely destroyed by proper cooking. It never survives the temperature of the coagulation of albumen. It follows, therefore, that to avoid all danger of trichiniasis—and let me add, of meat parasites of any kind—it is only necessary thoroughly to cook all meat, and never to eat it in an underdone condition. Some will say, that such was always done in this country, but practically it is not so. The number of cases of tapeworm, and of trichiniasis which we observe in this country, is quite large enough to admonish us to enforce with particular care the old kitchen rules:—Let veal be well done, rather too much than too little. Let pork be well done, until the crust crackles, and the flesh comes everywhere off the bones; until the flaps of fresh bacon or salted ribs are quite tender, and skin and tendons in a gelatinous state. Any meat which is not so cooked, any sausage that is still a little reddish in the middle, any roast pork that still yields a little red juice—reject it absolutely and warn others of it. As for underdone beef, the case admits of a choice; the chance of catching a parasite from beef is smaller than that of obtaining it from veal; then the possession of such a customer is not a danger to life. Therefore as to beef everybody may exercise his own discretion or please himself. But as to pork, let no one trifle with it; I am, from experience, deeply impressed with the awful nature of fleshworm disease, and if by my warning I could prevent even the occurrence of only a few, I should consider my present efforts rewarded.

In conclusion I will endeavour to show you some of the trichinæ, which now for more than two years have lived in this experimental rabbit. The animal contains many hundred thousands. One of my pigs contained at least five millions; C. Oertel harboured some twenty-nine millions; the German in Whitechapel some forty millions. You will appreciate that state of things by seeing them alive in and out of their capsules. Great is the danger, but your protection from it is perfect, if you will avail yourselves of it. Man's safety and welfare rest upon the continued exercise of all his faculties, and the practise of the experience of all generations before him. To illustrate this proposition by one of the newest developments of science has been the object of this paper.

It gives me great pleasure to express my obligation to Messrs. Orchard, father and son, opticians, of Kensington, for the very excellent manner in which they have exhibited to the meeting the various preparations above alluded to, by means of their improved oxyhydrogen microscope. Nothing could surpass the fidelity and clearness of definition with which the entire objects and their finest details appeared on the screen. Every single chalk-corpuscle of the cysticerci, every taenia-egg, with its shell distinct from its contents, the tubercles of the hooks and their sharpest points; the organisation, the eggs, embryos, and ripe young of the female trichina; and lastly, most wonderful of all, the internal organisation of the living and moving trichina spiralis—all these details appeared on the screen with a beauty which no ordinary microscope could equal, and were perceptible to spectators in the most distant parts of the room.

It will give additional interest to the bladderworms from veal which were exhibited if I state that they are some of those first reared by Professor Leuckart, of Giessen, and mounted on the slide on which they were exhibited by his own hands. Besides these, I owe several other interesting specimens to the kindness and liberality of Professor Leuckart, and much information to his beautiful collection, in the inspection of which I spent many happy and instructive hours.

The head of the *Taenia grandis* exhibited was presented to me by Mr. F. M. Rimmington of Bradford, together with the beautiful dyed links of the *Taenia solium*, which elicited the special approval of the chairman. Both these preparations are mounted with Mr. Rimmington's glycerine jelly, and are in a state of perfect preservation. I have mounted many specimens with this excellent medium, and can testify that for zoological and medical purposes it surpasses all others in effect and facility of manipulation.

Some of the *Taenia solium* heads were presented to me by Professor E. Wagner of Leipsic, and I take this opportunity of thanking him for his generous gifts.

The splendid specimen of encapsuled trichinæ in human muscle, with the bloodvessel injected by the hands of the late Mr. Quekett (View No. 25), I owe to the kindness of Mr. Norman, preparer of specimens for the microscope. I take this opportunity of stating that I have given to Mr. Norman materials from a number of remarkable cases, illustrating various points in the history of trichiniasis, and that those interested in the subject may obtain them from him.

The fine specimen of echinococcus heads was given me by Mr. Nettleship, an assiduous student of medicine at King's College. It was the means of a perfect demonstration.

Thus it will be seen that the co-operation of a great many workers in various parts of the field of science was requisite to secure the objects of natural history which were exhibited this evening. I beg that they all may continue hereafter thus to assist my endeavours, and be sure of my due acknowledgements and reciprocity.

DISCUSSION.

Dr. Cobbold, F.R.S., said he was sure this most important subject could not have had more justice done to [illegible] had been done by Dr. Thudichum on this occasion. If he were disposed to find a slight fault with such [illegible] as that which they had listened to with so much [illegible]re, it would be simply this:—he thought the [illegible] author had embraced for one evening's discourse [illegible] subject than he could possibly do full justice to [illegible] details; and it was remarkable that he had gone [illegible] such a mass of facts in so lucid a manner, con[illegible]g them as he had done. He was quite sure that [illegible] Germany no native of that country could have [illegible] such a clear exposition of the subject as Dr. Thudi[illegible] had done in the English language. Perhaps he (Dr. Cobbold) might speak a little confidently on this [illegible]ct, having been engaged for the last fifteen years in [illegible] investigation of the subject of entozoa in all its [illegible]es; he would however confine the few observations [illegible] to offer to the creature last treated of—viz., the [illegible]ina. In conjunction with Professor Symonds, of [illegible] Veterinary College, and individually as well, he had [illegible] working at this subject, and had experimented upon [illegible] different kinds of animals, fifteen being mam[illegible] and five birds; these twenty animals he had fed [illegible] trichinous food. In a great proportion of the [illegible]malia he had succeeded in rearing the trichina, [illegible] the case of the rabbit exhibited this evening, [illegible] with none of the birds was he successful [illegible]ng so, and his experience in this respect corres[illegible] with that of a number of gentlemen who were [illegible]ed by the Board of Trade in one of the States [illegible]many to conduct experiments on this subject. It [illegible] that birds could not be infected by the trichina, [illegible] by any ordinary modes of experiment. He [illegible] mention that he was one of those individuals to [illegible] Dr. Thudichum referred, having lately made [illegible] meals upon cattle-plagued ox hearts and [illegible] hearts, and pork cutlets infected with bags [illegible]rosperms, and he had also eaten flesh from almost [illegible] the experimented animals in which he did not [illegible]eed in rearing the trichina, not being satisfied with [illegible]oscopic examination alone; and he might add that [illegible] had eaten cattle-plague meat with no injurious [illegible]ts. In the case of actual trichinous infection, how[illegible], he would not eat the flesh unless it had [illegible] boiled for a very considerable time, for he [illegible] boiled flesh — human flesh — full of trichina [illegible] ascertain what these creatures would bear, and [illegible] after five minutes' boiling he was not able to [illegible]y himself that they were dead. They coiled them[illegible]ves up rigidly, it was true, but they had undergone [illegible] material change, and he was inclined to think they [illegible]ght still be alive, though he could not absolutely [illegible]ert that they would have infected him if he had eaten [illegible]m. He would mention a fact, to show how difficult [illegible] was to persuade people that meat was really diseased. [illegible] long since he had had a pig killed which had been [illegible] upon trichinous food. More healthy-looking flesh, [illegible] the naked eye, could not be seen, and yet there were [illegible],000 of trichinæ in the carcase of that animal. [illegible] people by whom the pig had been slaughtered were [illegible] cautioned against allowing the flesh to go to a [illegible]tcher's, for fear of producing an epidemic; but not[illegible] that precaution, they were so satisfied in [illegible] own minds that the flesh was wholesome, that they took away the heart and portions of the offal as their perquisite. Most fortunately, however, it was the case that the trichina would not remain in the heart or viscera, and thus no harm was done. He mentioned this fact merely to show how easily diseased meat might get into the market, and unless a proper inspection was made by competent persons like Dr. Thudichum and others, there was great danger of this fearful disease being propagated in this country, and he considered it of the utmost importance that such competent authorities should be appointed.

The Chairman said he now rose to perform the most agreeable, and ordinarily the easiest of his duties, but in calling upon them to return their thanks to the author of the paper just read and discussed, he felt a difficulty, arising from a sense of the imperfection of our human nature, which demands an unusual exertion of the moral sense to stir up a proper feeling of gratitude to the man who had been telling them a number of disagreeable truths. A week or a fortnight of abated zest, not to say dread, of the roast beef, mutton chop, veal cutlet, or boiled leg of pork, might elapse before the impressions faded, and a proper frame of mind was regained, in order to a hearty vote of grateful thanks to Dr. Thudichum for the pains and skill with which he had imparted and illustrated the important mass of knowledge he had laid before the meeting. The evils and hazards he had indicated had long been in existence, and might long continue; but the only power of abating them lay in the knowledge of the causes so clearly and perspicuously laid before the meeting that evening. For any summary of the information and results of this body of doctrine on parasitic disease there now remained little time. In reference to the domestic animal the hog, from which man was liable to derive the worst and most pestilential of his internal parasites, viz., *Trichina spiralis*, we must see that the remedy or defence lay in good wholesome feeding of the animal and thorough cooking of the meat. That the detestable habit of allowing the pig to subsist, until preparation for slaughter, on garbage, would now be known, and ought everywhere to be known to involve, through any refuse of animal matter such garbage might include, the imminent risk of the introduction of trichinal germs into the beast, and the transference of these parasites into the bodies of the pork-eaters, with the consequences which the author of the present paper had so forcibly and truly set before them. Trichiniasis was by no means uncommon where ignorance prevailed, or where the knowledge of the facts was disregarded. But, as he must be brief at this hour, he would limit himself to some higher or wider relations which the history of this disease suggested. Trichiniasis was a rare, if not unique, example of a malady that was really known scientifically to the physician. It was a most instructive, most suggestive instance of what we were striving that medical science should be, and, we might hope, would one day become; it was the instance of a disease of which the cause had been discovered, the nature recognised, the symptoms intelligently understood in reference to the changes of tissue, and the interference with the action of vital parts, occasioning them. In this disease, the relations of the symptoms, histological and physiological, were at length a possession of the physician. He therefore had the power of determining on truly scientific grounds what to do and what to forbear; he knew how far he could go, and in what way, towards the cure or arrest of the malady; and he also knew the limits of his curative means; he could now, on sure grounds, prognose or prophecy respecting it. He left to the countless other ills that flesh was heir to, the symbols of his ignorance of them, exemplified by the vague names "a cold," "indigestion," "typhus," "rheumatism," &c., which terms would have been applied respectively to the several stages of the malady occasioned by the entry of trichinæ into the system, before that wormlet had been discovered. He knew that, like the blight, to which our gardeners referred the various maladies of plants, they were mere signs or masks of the ignorance

of the physician as to the real cause of the symptoms before him. The observations of Ruprecht, Wagner, Tüngel, and other acute and philosophic practitioners, as ably summarized by Dr. Thudichum in his valuable and instructive report to the Privy Council,* seemed to him (the Chairman) to have a philosophic purpose and bearing, rising beyond their immediate application and benefit. They illustrated the true ways and means by which medicine, as a science, might be advanced. They showed how closely dependent that advance was on the progress of collateral sciences, and especially on those relating to the animal kingdom. The foundation of the exceptionally bright page in the records of medicine represented by trichiniasis, was the result of a purely zoological research, of an application of the microscope to the extension of the bounds of our knowledge of the class *Entozoa*. And this naturally led him to remark that the greatest improvement in the treatment or the mastery of a disease had been more often due to an advance made in a collateral line of knowledge, than to exclusive study of the disease itself. A physician might have devoted his whole time to the small-pox, but would not thus have hit upon vaccination. The wider views of the naturalist Jenner, the favourite pupil of the greater naturalist Hunter, imbued with his master's physiological principles, were the conditions of that blessed gain to mankind. And he was here led to commend these considerations to the attention of legislators in reference to the profit and advantage—taking the lowest view of the matter—that might accrue to the nation by providing the means and instruments indispensable to the due progress of biological science, viz., an adequate national museum of Natural History. The subject had been discussed in that room during the present session, and had been treated by gentlemen holding the honourable position of legislators, in a spirit which showed that the lesson taught by the history of trichiniasis was not wholly uncalled for. In 1866 as in 1862 the main end of a national collection was argued to be to amuse and give elementary instruction to the public. The conditions which 30 years' experience convinced him to be essential to such a collection of natural history as an instrument in the advancement of science, were repudiated together with the aim itself. He read, *e.g.*, in *Hansard*,† "Prof. Owen seemed to be the person upon whose sole authority the monstrous outlay of £700,000 was to be justified!" But what if such sum spent on advancing the knowledge of the nature of animals should turn out to be the essential step to a saving of seven millions of money, it might be in one year! The cure or prevention of the rinderpest was less likely to be the result of direct study of the disease than of a collateral ray of light shot from a discovery or step in advance in general physiological science. All analogy taught this. The utmost that the ablest surgeon, *quâ* surgeon, could do in the improvement of his art as applied to the treatment of aneurism was done in Hunter's day, by his famous contemporary Pott, of St. Bartholomew's. He gained just reputation by advocating, for the common popliteal tumour, amputation of the thigh, instead of the operation of cutting out the dilated and diseased part of the arterial canal, then in vogue, with frequent fatal result. Hunter, seeking truth in a better way—the way of the wise and prescient legislator, who might assign for the essential instrument in animal physiology the sum even of £700,000, made the required practical discovery, and saved both life and limb. Hunter spent his fortune and much of his valuable time in an extensive museum of comparative anatomy. His investigation of the phenomena of the growth of the antlers of deer, in connection with another branch of natural history, made known to him the singular capacity of arteries to enlarge agreeably with the stimulus of demand, and again to contract perma- nently when the supply of blood was not needed. He was bold enough with this knowledge to propose to effect arrest of the flow of blood through the main channel sup- plying the limb, and he had the gratification of see the cure of the aneurism, not mortification of the li as contemporaries predicted, prove to be the result of experiment. The comparatively safe and simple ope tion of the ligature, or obliteration of the arterial tr —one of the most brilliant advances of the heal science in reference to the extensive class of aneuri diseases—was suggested by observations in nat history, as abstract, and as little likely, *à priori*, to l to such practical result, as the study of microsc worms or of gigantic whales! "Were they awa asked an Hon. Member, addressing the House, " Professor Owen called upon them to build a hall for reception of whales, of which there were no less t fifteen different species?" To which question a dis guished statesman replied—"Sooner than go to the pense of paying £50,000 when we can get for £10,000 an acre, I, for my part, am wi with my hon. friend, to exclude whales altog from disporting themselves in Kensington-garden The inspiration under which it was believed P sung:—

> "From Nature's chain, whatever link you strike,
> Tenth or ten-thousandth breaks the chain alike,"

was of a higher mood, and bespoke broader and views. And we might well suppose that, not eve reduce an estimate or gain a vote, would Queen An Premier have consented to dislodge "one step in great scale," nor in the exposition "of full cre leave a void." Let them picture the legislator on bed of unrest, with a painful operation certainly, loss of life probably, before him, and the risk only to be lessened by loss of limb; it have been revealed to him that a given gress in zoology would one day light the w an easy cure, recollections of the fling at "the mere thusiast with his ten-acre scheme,"† whereby the had helped to the rejection of the essential mea advancing natural history would afford him comfort. The greatest commercial empire in the w the wealthiest, and one with the widest sprea flourishing colonies, possessed means and advant over all other countries for the collection and system display of the created works. Our contine fellow-workers in science saw the continued of such display with regret and wonder. It to be hoped that another year would not el ere England took her befitting course to en herself with that material symbol of advance whi public museum of natural history embodies, and for quately effecting which, in reference to its highest her resources and command of the world gave her liar advantages and facilities. Such were some of conclusions which he was led to deduce from the ings and treatment of the subject of that eveni discourse, in reference to increased knowledge and p of dealing with disease in general, and especially those of the domesticated animals affording the p lation the bulk of their animal food.

Proceedings of Institutions.

Metropolitan Adult Educational Associati A conference of delegates from the institutions, wor men's clubs, and young men's societies, connected this Association, was held at the Society of Arts Thursday evening, the 12th April (by permission Council), to take into consideration the arrange

* "On the Parasitic Diseases of Quadrupeds used for Food." Appendix No. 7.

† Debate on Museum of Natural History, May 19th, 1862, (Hansard), p. 1928.

* "Hansard," *ut supra*, p. 1,928.

† "Hansard," *ut supra*, p. 1,910.

[fo]r athletic sports, to be held under the auspices of the [As]sociation, at the Crystal Palace, in June. Sir F. R. [Sa]ndford presided. Mr. H. H. Sales, the secretary, [af]ter having described the origin of the annual *fête* in [1]864, and the great success that attended it, and also [th]at of last year, noticed in detail the arrangements [hi]therto made and the alterations proposed. In the [s]ports, it was suggested that a wider distinction between [to]wn and suburban societies should be made, so as to [pu]t competitors on a more equal footing. In consequence [o]f the small number of entries for the band contest, he [su]ggested its discontinuance. At the first *fête*, an open-[ai]r concert of 800 voices was given, but the result was [s]o unsatisfactory that it was not renewed. This year an [ou]t-door concert on a large scale was proposed. The [oth]er details of the *fête*, such as the balloon ascent, [en]tertainments by professional gymnasts (under the [dir]ection of Mr. Nelson Lee), distribution of prizes, [an]d other matters, would not need discussion. Captain [Mc]Gregor strongly urged the encouragement of those [spo]rts that did not require much space, so that members [nee]d not go from their institutions to practice. A row-[in]g match, he considered, would not only be attractive [bu]t profitable. The delegate of the Duck-lane Club [ur]ged most strongly a more equitable competition in the [s]ports, so that the old men might have a chance. He [wa]s turned fifty, and could not run a mile race, but he [cha]llenged any other man not younger to a three hun-[dre]d yards' spin, and hoped there would be something [th]is year for men between fifty and ninety. The dele-[ga]te from Greville-house Institution suggested larger [pri]zes in some events. The delegate from the West [Lo]ndon Youths' Institute hoped that silver medals and [cu]ps would be substituted for money prizes. Ultimately, [o]n the motion of the delegate from the London Me-[cha]nics' Institution, seconded by the delegate from the [Be]aumont-house Club, it was resolved to appoint a sports [com]mittee, to consist of a delegate from each institution. [At] the conclusion of the conference a selection of glees [and] part-songs were sung by a choir consisting of mem-[bers o]f various societies, under the direction of the Rev. [J.] A. Macilwain. Sir F. R. Sandford thanked the con-[duct]or and choir, especially Mr. Heller, who had so care-[full]y trained the greatest number, for their efficient ser-[vic]es; and on the motion of the Rev. C. Jacob a cordial [vo]te of thanks was given to the chairman.

RAILWAY REFORM.

In Messrs. Travers' Circular, this subject is concluded [a]s follows:—

The transfer of the railways to the Government is [re]commended by the various considerations: (1) That the [di]fference between high charges and low charges has a [co]mparatively small effect on the company's revenue. [(2)] That the difference could be met by the saving [ef]fected in the decreased dividend paid to shareholders [aft]er the transfer had taken place, the shareholders of [co]urse being compensated by the superior security of [G]overnment stock; and (3) That amalgamation, by [co]nsolidating the management, would effect a great [sa]ving in the working expenses. It remains to notice [o]ne or two of the objections which have been made to [t]his momentous project. The most prominent and the [m]ost frequently repeated of all is the argument that [G]overnment is not fit to manage such an enterprise as [t]he gigantic railway system of the country. We should [g]et, it is said, the execrable principles of red-tape and [ci]rcumlocution applied to this as to other Government [con]cerns. The Government patronage, too, would re-[cei]ve a huge and most undesirable accession. This [ob]jection has been already answered. Government pur-[cha]se does not necessitate Government *management*, but [on]ly Government control. And as for circumlocution, it [h]as not been found that the Post-office has its vitality [st]rangled by these vicious administrative practices. There is plenty of room for improvement in the details of Post-office management; but that private enterprise is not enough to guarantee us all the improvements we need, the railways themselves prove only too satisfactorily.

2nd. There is the general, and in many cases very meaningless cry against centralisation. But surely it is nonsense to talk about encouraging centralisation, when we reflect that the London and North Western Company have in their hands a "territory" some 1,200 miles in extent. Their total capital is between thirty-eight and forty million pounds. Their receipts are between five and six millions per annum. With a company of this extent, commanding the communications of such vast districts, and drawing the revenue of a principality, it is too absurd to begin to apprehend mischief from railway centralisation. Or take the Lancashire and Yorkshire, traversing the busiest and most important region of the country—although its productive mileage is barely four hundred—and drawing a revenue of very nearly two millions. Is not this centralisation to all intents and purposes?

3rd. It is called a monstrous and appalling thing deliberately to add over four hundred millions to the national debt. But there are two sources of national debt. The millions that found their way during the prolonged French wars into the military chests of the continent, and were no more seen, involve us in the most unpalatable kind of debt. We have spent the borrowed money and have nothing to show for it. But if we get four hundred millions into debt in order to get the railways into our hands, it would not be the sheer thankless owing of money. We should have our money's worth to show for it. The state debt would be increased by four hundred millions, but then the state assets would be increased by just the same amount.

4th. It is apprehended that so tremendous an operation as the conversion of all the railway stock into Government stock would afflict the money market with a convulsion which would mean confusion and ruin to thousands of persons. If the change were made in a week, this would be a serious objection. But English financiers are not so clumsy and inexperienced in great operations as to be unable to spread the conversion over a sufficiently wide space of time; indeed, we have already pointed out the way in which the change would probably be conducted.

Against all these considerations, besides the particular answers which it has been attempted to make to them, there must also be set the general position:—First of the shareholders. Can they reasonably expect the legislature to maintain for them their monopoly of the public conveyance as against the plain interests of the community? Are the public to be sacrificed, as they must be if competition is discouraged or prohibited? To borrow the illustration furnished by our correspondents of last week. The Great Western had the monopoly of conveyance between Swansea and London, so they charged 45s. per ton for tea. Another company get access to Swansea, and instantly a reduction of more than 33 per cent. takes place, the rate per ton now being 30s. We have already spoken of coals. If there were unlimited competition, we might have them in London at considerably under 10s. a ton; as it is, we pay sometimes over 30s., and never less for household purposes than 20s. When these facts get fully before the public, it is incredible than any toleration will be afforded to the preposterous assumption on the part of the companies that their monopoly is guaranteed, and that to expose them to competition is to show an unjust disregard of vested rights. The advantage, then, promised to the railway proprietor is that he may realize the full value of his stock now, and though receiving lower interest it will be much higher than he can expect when competition has got the full swing it must have, and besides this he has the best possible security.

Second. The advantages promised to the public are these:—A low and uniform tariff for passengers by ordi-

nary trains—first class, ¾d. per mile; second-class, ½d.; and third-class, ¼d., with rather higher rates for fast trains. A correspondingly low, and, to some extent, a uniform rate for goods. This reduction in railway charges would, it is contended, be equally beneficial to all classes; a reduction to one-third of our present charges would be to all intents and purposes equal to a reduction in taxation of twenty-four millions.

Granting, however, that public opinion may be, for some time to come, unripe for the execution of so unfamiliar an idea, there is one direction in which Government interference is expected, and from which a very considerable benefit may be reaped by the public. If it does not appear expedient for the state to buy the railways, the right of the legislature to revise the tariff is already fully established, and the least result that we can anticipate from the labours of the commission that is now sitting will be a recommendation that this right should be exercised. It may be difficult or impossible to carry reduction and a greater uniformity of charge to so full an extent as if the state were the proprietor of the railways. But that these important reforms will in some measure be carried out is quite certain. Two-and-twenty years ago a tremendous cry was raised by the railway interest, when the companies were forced to run certain trains in which they were only to charge third-class passengers a penny a mile. The same sort of cry will no doubt be raised again. But it is to be hoped that the guardians of the public interests will remain firm to the great principle solidly established in 1844 by the legislative institution of compulsory "parliamentary" trains. That Government has no right to interfere with the working of private undertakings was the cry then, as it will be again. Let us borrow from the *Times* of 1842 a description of the sort of evil which the public had to endure, and which the companies claimed their right to perpetuate if they chose. "A third-class passenger leaves Paddington in an open carriage, no difference being made to counteract wind or weather, at half-past four a.m. When he arrives at Swindon he is detained upwards of an hour, and at length gets to Bristol, if the train keeps its time, in nine and a half hours, while the first and second-class carriages make the same journey in less than half the time. If a third-class passengers wishes to go on to Taunton from any place east of Bristol, he is detained from four to five hours in Bristol, and is kept on the road, at a moderate calculation, from fourteen to sixteen hours; whereas, on the other hand, first and second-class passengers arrive at the same destination in six and a half hours." Perhaps in the year 1888, when our descendants read of the enormous fares that we pay now, of their inconsistency on different lines, of their inconsistency in the case of goods of very much the same kind, of their gross disproportion to the cost, they will wonder how such a state of things was endured for a day, just as we wonder how even the smallest attention was paid to the remonstrances of railway directors when they were compelled to desist from such treatment of passengers as that we have just described. If the state cannot purchase the railways with advantage, at least it may fix the fares and freightages, just as it fixed the fare of a certain kind of train two-and-twenty years since. The principle was admitted then. There can be no reason why its application should not be extended now.

Fine Arts.

Art Galleries in Paris.—As the opening of the annual exhibition on the first of May attracts many artists and amateurs to Paris, it will be useful to mention that some important changes have taken place with respect to the works of living artists, the property of the public. The Luxembourg Gallery has been completely re-arranged, and a new department constituted for the works of artists recently deceased; here they will remain for five years after the death of the author, when they will be removed, in accordance with former practice, to the Louvre. The worst-lighted gallery, namely, that which contained works by foreign artists, has been closed, and the pictures transferred to the gallery of the late Duc de Morny, in the Palace of the President of the Corps Législatif. Amongst these are pictures by Achenbach, Heilbuth, Ch. Gleyre, Louis Knaus, Palizzi, H. Scheffer, Hamman, and Schreyer. These not being sufficient to fill the gallery, a certain number of French works have been added, including, amongst others, "Joan of Arc," by Ingres; "Haymaking," by Rosa Bonheur; "Bullocks Going to Labour," by Troyon; "A Coast Scene," by Isabey; "A Woodland Scene," by Th. Rousseau; "Arabs," by Fromentin; and "Scene of the Saint Bartholomew," by Robert Fleury.

Water-Colour Exhibition at Brussels.—The Exhibition of the Belgian Society of Water-colour Painters opened on the second of April. This is the eighth exhibition of the Society, and is reported to be far above the average. The number of works exhibited is nearly [illegible] hundred, and a great many have already been purchased either for the lottery established by the Society, or by private individuals. Art in all its phases seems to be flourishing in Belgium, perhaps more than in any other country in Europe as regards the higher quality.

Manufactures.

Russian Worsteds and Woollens.—The manufacture of naploss or plain woollen stuff goods has not made the same progress in Russia as the production of cloth. The mechanical spinning of long-staple or combing wool, which met with so many difficulties in other countries, was first practically undertaken in Russia about the year 1845, by the brothers Gutchkoff. Following in the steps of foreign manufacturers, they began by combed or spinning wool, making use of Russian raw material. The yarn thus produced proved adapted to cheap mixed worsteds, as well as to pure fabrics of pure wool, of middling quality, such, for instance, as mousseline-de-laine, the inequality and want of smoothness of the yarn being almost entirely concealed by the colours. In 1850, five more mills were opened in Moscow for the spinning of combed wool. These principally use the best qualities of Russian wool. The machinery employed by the brothers Gutchkoff is chiefly of French origin, the apparatus of Heilman Schlumberg being preferred. Flint and Donisthorpe's machinery is used at Count Lamsdorf's manufactory, St. Petersburg. The weaving of smooth worsted fabrics preceded the introduction of machine weaving of long-staple wool, especially as regards printed woollens, but it has, nevertheless, not made the same progress as the manufacture of cloth, silk, and cotton. The want of this necessary material has not been so great an impediment as the influence of fashion, which requires a constant production of new designs. These fabrics being also principally consumed by the wealthier classes, have a comparatively restricted market. The consumption of mixed woollen goods is, however, on the increase in Russia, and will, no doubt, greatly promote the spinning and weaving of long-staple Russian wool. Technically speaking, the weaving of long-staple wool is making rapid progress in Russia, although still in the hands of but few manufacturers. Jacquard and other improved looms are being widely introduced, and the art of dyeing is now more carefully studied.

Colonies.

Queensland—Revenue and Imports.—A comparative statement of the consolidated revenue of this colony paid into the treasury during the years ended Dec. 31st, 1864, and Dec. 31st, 1865, shows considerable progress

The figures are as follows: 1864, £502,456; 1865, £631,431. During the year 1864 the declared value of the imports at Brisbane amounted to £1,677,547; and the declared value of the same for the year 1865 exceeds the previous year by £293,607.

Pastoral Pursuits in Carpentaria.—In the year 1861 the stock was estimated—cattle, 29,236; sheep, 402,358; horses, 2,161. The settlers have taken up 4,973 miles, and as the lowest amount of stock required to hold the country so acquired would amount to not less than 125,000 sheep, it will not be extravagant to estimate an increase of 50 per cent. on the numbers computed in 1864 as representing the amount of stock in Jan. 1866 existing in Northern Queensland.

Paraffine.—New South Wales.—A Sydney paper says that the works of the Hartley Kerosene Oil and Paraffine Company are progressing rapidly. The company erected an experimental plant in Sydney, and have been recently engaged in making experiments on the extraction of the crude oil, and in the refining it so as to produce a good article. The substance to be operated on differs greatly from the Boghead coal, and therefore requires its own peculiar treatment; but the results of these experiments are said to be that the company can now produce an oil of any specific gravity required for burning free from colour and with scarcely any smell. The remaining heavy oils produce an excellent article used for lubricating machinery, and from them is extracted paraffine. The company had about 300 tons of coal raised and on the ground. The quantity of oil procured from a ton of coal is 160 gallons; the quantity of gas is 18,000 feet per ton.

Obituary.

Professor William Dick, Veterinary Surgeon to the Queen, and Professor of Veterinary Medicine at the Veterinary College, Edinburgh, died on the 4th April, in the 73rd year of his age. In Professor Dick the veterinary profession of Great Britain has perhaps lost its most distinguished representative, and Scotland the man to whom it owes the honourable position it has so long maintained in veterinary practice, and especially in veterinary education. The Edinburgh Veterinary College was founded by him, alone and unaided, in 1818; it was patronised by the Highland and Agricultural Society of Scotland in 1823, and established by Royal charter in 1842. During that long period, the college, as an educational institution, and Professor Dick in his relations to it, as well as in his general practice, have commanded the confidence and ready co-operation alike of the scientific and the practical men, of the proprietors and the tenant farmers of Scotland. Professor Dick was readily acknowledged by the most accomplished medical professors of our University to have a position as scientific as their own, while the practical mind of the agriculturists of Scotland recognised in him one in whom they at once learned to respect the veterinary art. The treatise on this subject which appeared in the *Encyclopædia Britannica*, and was afterwards published separately, is the only formal treatise which he has left behind him. He was secretary to the Royal Physical Society of Edinburgh for many years, and at the outbreak of the cattle plague he was appointed Government Inspector of Foreign Cattle for the county of Mid-Lothian.

Notes.

Rochelle Exhibition.—An exhibition embracing the Fine Arts, Industry, and Horticulture, is announced to take place at La Rochelle in May at the same time as the annual Agricultural and horse exhibition occurs. The Fine Art exhibition will include not only the works of living artists, but also pictures and other objects of art of all classes belonging to collectors. The exhibitions are announced to open on the 21st May, and the Fine Art and industrial portions will remain open for one month.

MEETINGS FOR THE ENSUING WEEK.

Mon......Geographical, 8½.
Antiquaries, 2. Annual meeting.
Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1. Mr. T. A. Rochussen, "On the Performance, Wear, and Cost of Maintenance of Rolling Stock." 2. Mr. Robert Manning, "On the Results of a Series of Observations on the Flow of Water off the Ground in the Woodburne district, Ireland."
Zoological, 8½.
Ethnological, 8. 1. Mr. John Thrupp, "On the British Superstitions relating to the Hare, the Goose, and the Fowl." 2. Mr. Thomas Wright, "On the Intercourse of the Romans with Ireland."
Royal Inst., 3. The Rev. C. Kingsley, "On Science and Superstition."
Wed. ...Society of Arts, 8. Mr. Jabez Hogg, "On the Perils of Mining, and the Means for Preventing them."
London Inst., 12. Annual meeting.
R. Society of Literature, 4. Annual meeting.
Archæological Assoc., 8½.
Geological, 8. 1. Sir Philip de M. G. Egerton, Bart., M.P., "On a new species of *Acanthodes* from the Coal-shales of Longton." 2. Mr. Harry Seeley, "On the Gravels and Drift of the Fenland." 3. Mr. Alfred Tylor, "Remarks upon the interval of time between the formation of the Upper and Lower Valley-gravels."
Thur. ...Royal, 8½.
Royal Society Club, 6.
Royal Inst., 3. The Rev. C. Kingsley, "On Science and Superstition."
Fri ......Society of Arts, 8. Cantor Lecture. Dr. Crace Calvert, F.R.S., "On the Transformation of Organic Acids and Animal Substances." (Lecture III.)
Royal Inst., 8. The Very Reverend the Dean of Westminster, "On Westminster Abbey."
Sat ......R. Botanic, 3¾.
Royal Inst., 3. Mr. George Scharf, "On National Portraits."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 24th March*, 1866.

85. Bills—Lunacy Acts (Scotland) Amendment.
86. " Cattle, &c., Contagious Diseases.
88. " Poor Persons Burial (Ireland).
130. Railway and Dock Bills—Return.
131. Population, Houses, &c.—Return.

Session 1865.

461. Commons and Open Spaces—Return.

Delivered on 26th March, 1866.

41. Bill—Petit Juries Ireland).
15. (306 to 312) Railway and Canal, &c., Bills—Board of Trade Reports.
113. Public Accounts—Special Report on the Exchequer and Audit Departments Bill.

Delivered on 27th March, 1866.

114. Election Petitions—Return.
122. National Gallery—Return.
126. Tame Valley Viaduct—Return.
132. Dublin Metropolitan Police—Account.

Delivered on 28th March, 1866.

128. Harbour Loans—Return.
134. Navy—Return.
151. Civil Services—Statement of Excesses on Grants of 1864-65.

Delivered on 31st March, 1866.

89. Bill—Grand Juries Presentment (Ireland).
117. Parish Ministers (Scotland)— eturn.
135. Accidents (Metropolis.—Return.
68. (ii.) Trade and Navigation Accounts (28th February, 1866).

Delivered on 5th April, 1866.

79. Bengal Sanitary Commission.
104. Metropolitan Police—Accounts.
105. Bank Notes—Return.
141. Ships *Octavia*, *Constance*, and *Arethusa*—Return.
152. Civil Services—Abstract showing Grants proposed for 1866-7; sums voted on account; and sums required to complete.

Delivered on 6th April, 1866.

15. (313 to 326) Railway and Canal, &c., Bills—Board of Trade Reports.
124. Army—Account of Receipt and Expenditure.

Delivered on 7th April, 1866.

81. Bills—Railways (Guards and Passengers Communication).
90. " Cattle Assurance.

15. (327 and 328) Railway and Canal, &c., Bills—Board of Trade Reports.
147. Stephens, James—Report of the Inspectors General of Prisons.
149. Army (Hong Kong and Kowloon)—Report.

Session 1865.

442. (A. ix.) Poor Rates and Pauperism—Return (A).

Delivered on 9th April, 1866.

84. Bill—Commons (Metropolis).
Public General Acts, cap. 7 to 13.

Delivered on 10th April, 1866.

136. Doe Park and Bradford Reservoirs—Further Correspondence.
139. Totnes Election—Minutes of Evidence.
109. Navy (Masters)—Return.
148. Army (Officers and Men Drowned, &c.)—Returns.
University Education (Ireland)—Letter.

Delivered on 11th April, 1866.

76. Bills—Common Law Procedure Amendment Acts (Ireland).
96. ,, Cattle, &c., Contagious Diseases (Amended).
112. East India (Mysore)—Correspondence.
155. New Courts of Justice and Offices—Estimate.

Delivered on 12th April, 1866.

92. Bills—Local Officers Superannuation (Ireland).
100. ,, Art.
168. Borough Electoral Statistics—Return.
169. Voters—Return.
170. Electoral Statistics—Return.
150. *London* Steam Ship—Evidence.

Delivered on 13th April, 1866.

90. Bill—Marriages (Ireland).
138. Committees—Returns.
142. Courts of Probate—Accounts.
166. Portpatrick and Donaghadee Harbours, &c.—Correspondence.
140. Great Yarmouth Election Petition—Minutes of Evidence.
Cattle Plague (Ireland)—Sequel to the Report of the Committee.

Delivered on 14th April, 1866.

153. Colonial and Foreign Possessions—Return.
161. Edinburgh Parliamentary Burgh—Return.
164. Peerage of Ireland—Returns.
165. Exchequer Bills—Return.
167. Immigrants and Liberated Africans—Return.
171. Dublin Port—Return.
173. Metropolitan Board of Works—Return.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation.
Victoria, Australia—Further Correspondence.
Pollution of Rivers—First Report of Commissioners.

Delivered on 16th April, 1866.

91. Bills—Customs Duties (Isle of Man).
97. ,, Finsbury Estate.
98. ,, Crown Lands.
102. ,, Divorce and Matrimonial Causes.
15. (329) Railway and Canal, &c., Bills—Board of Trade Report.
63. (v.) Committee of Selection—Sixth Report.
115. Isle of Man (Financial Measures)—Correspondence.
158. Burghs (Scotland)—Return.
159. Cattle Plague—Return.
162. Municipal Boroughs, &c.—Return.
163. Humber River—Correspondence.
172. Tidal Lands and Epping Forest—Correspondence.
185. Cattle Importation (Netherlands)—Order in Council.

Patents.

From Commissioners of Patents' Journal, April 13th.

GRANTS OF PROVISIONAL PROTECTION.

Bricks—3125—P. Bawden.
Cast steel, transforming scraps of steel and iron into ingots of—859—C. E. Frooman.
Central fire breech-loading cartridges—880—W. T. Eley.
Cleaning—837—C. Rosière.
Coffer dams—816—H. King.
Cooking apparatus—895—F. P. Warren.
Cricket and other balls—739—C. Huntley.
Croquet balls—884—W. Moseley.
Envelopes—848—H. Rankin.
Factories, &c., travellers for—411—W. N. Wynn.
Fibrous substances, treating—265—H. Sherwood.
Fire-arms, breech-loading—850—J. H. Burton.
Fire-arms, breech-loading, and cartridges for same—864—T. Wilson.
Fire-arms, gun cloth charges for—845—W. A. Dixon.
Furnaces—731—C. J. Richardson.
Goggles—890—S. H. Salom.
Gravitating level—749—A. V. Newton.
Guns, cartridges for breech-loading—868—J. Erskine.
Heat, generating—738—M. P. W. Boulton.
Hoisting apparatus—874—A. V. Newton.
Horse shoes—902—J. Gamgee.
Hot water pipes—429—G. W. Cumming and J. K. Edmonds.
Metallic stuffing box—715—V. Duterne.
Musical sounds, augmenting—892—J. Macintosh.
Music, turning over the leaves of—900—W. Dixon.
Oils, distilling—896—W. A. Lyttle.
Power hammer—872—A. V. Newton.
Printing machines—491—A. Applegath.
Railway carriages, propelling—851—H. E. Newton.
Railway engines and carriages, springs for—860—S. Moulton.
Ropes—854—R. Petty.
Safes—895—J. Bracher.
Salt—3105—D. Hall.
Screw gill boxes or hackle frames—866—B. Berry, jun., & G. Brealy.
Ships and vessels, reefing and furling sails of—876—J. Medhurst.
Spinning, self-acting mules for—831—L. R. Bodmer.
Steam boilers, generating steam in—878—R. Newton.
Steam turbines—891—C. Wenner.
Substances, softening—691—J. Patterson.
Substances used in purifying gas, treating—862—W. E. Newton.
Waste liquors, treating—863—C. E. Amos and W. Anderson.
Weaving, looms for—846—C. D. Abel.
Window fittings—867—M. Archdeacon.
Woven fabrics, drying and stentering—844—J. McNab.
Zinc—671—C. W. Siemens.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Ladies' skirts, hoops of—1015—S. J. Sherman.

PATENTS SEALED.

2664. J. Orrin and T. Geer.
2667. J. L. Hancock.
2668. J. L. Hancock.
2669. H. Skinner.
2688. T. Jones and E. K. Mason.
2689. C. H. Cope.
2703. A. L. McGavin.
2711. W. B. Haigh & W. Beal.
2716. M. L. J. Lavater and J. Kershaw.
2904. A. V. Newton.
3278. E. A. Dana.
132. A. F. Johnson.

From Commissioners of Patents' Journal, April 17th.

PATENTS SEALED.

2695. J. Penton.
2697. G. R. Ghiselin.
2698. T. Routledge, D. Bentley, and J. R. Jackson.
2709. J. and G. H. Needham.
2710. R. Fell and D. Hammond.
2713. W. Sumner.
2714. T. Cooke.
2719. I. Baggs.
2721. W. H. Kitchen.
2724. J. D. Frazer.
2725. J. H. Dickson.
2728. I. Roberts.
2731. W. Parsons.
2732. S. P. Matthews.
2738. A. Chaplin.
2741. W. Clark.
2745. H. Bateman & E. G. Garrard.
2747. D. G. and S. Staight and J. Cheverton.
2749. W. Clark.
2751. G. L. Scott.
2752. W. M. Scott.
2782. J. Buckingham.
2790. F. Tolhausen.
2844. H. J. Sanders.
2882. G. A. Ermen.
2891. W. E. Newton.
2894. E. T. Hughes.
2924. H. E. Newton.
2933. W. Clark.
3023. W. E. Newton.
3182. J. Warburton.
5. T. Prideaux.
16. A. and W. Young.
33. W. H. Towers.
40. E. Taylor.
486. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

930. R. Newton.
1025. W. A. Shaw.
1291. A. W. Hofmann.
937. J. Combe & J. H. Smalpage.
950. H. Eaton.
974. T. A. Weston.
1066. M. Henry.
947. H. A. Bonneville.
948. A. Marriott.
967. R. C. Clapham.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

921. R. A. Brooman.
1092. T. H. Arrowsmith.
933. J. Hughes, W. Williams, and G. Leyshon.
938. J. Beattie.
972. J. Seaman.
996. H. Rawson.
935. J. Luis.
957. W. E. Newton.
961. J. Sidebottom.
1006. E. Clark.
949. G. Ashcroft.

Registered Designs.

Triple Roller, Double-Action, and Self-Adjusting Mangle—April 9—4782—Messrs. Ross and Windows, High-road, Tottenham.
Portable and Adjustable Wind and Sun Rifle Screen—April 10—4783—Captain R. Leeson, Fitzwilliam-street, Cambridge.
Improved Bar for Feeding Racks for Sheep—April 11—4784—W. Brenton, Cornwall.
Fastening for the Lids or Covers of Box Irons and Charcoal Irons—April 11—4785—E. Siddaway, West Bromwich.
A Box Iron—April 14—4786—W. Cross, West Bromwich.
Part of a Portable, Folding, Spring or other Mattress—April 18—4787—G. T. Horrell, South-street, Finsbury.
Fan Box or Casing—April 18—4788—Powis, James, and Company, Victoria-works, Belvedere-road, Lambeth.

Journal of the Society of Arts.

FRIDAY, APRIL 27, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'Clock:—

MAY 2.—"On National Standards for Gas Measurement and Gas Meters." By GEORGE GLOVER, Esq.

MAY 9.—"On Military Shooting, and what is required in a Fire-arm by the Soldier." By Colonel WILFORD.

CANTOR LECTURES.

A course of four lectures "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," is now being delivered by Dr. F. CRACE CALVERT, F.R.S., as follows:—

LECTURE III.—FRIDAY, APRIL 27TH.

"ON THE TRANSFORMATION OF ORGANIC ACIDS AND ANIMAL SUBSTANCES."

The artificial production of *benzoic acid* (found in benzoin resin) from the essence of *bitter almonds* and from *coal tar* products, and its conversion into *hippuric acid* (found in the secretion of herbivorous animals); of *tartaric acid* (the acid characterising cream of tartar), from *sugar of milk* and from *succinic acid* (the acid obtainable from amber), and its decomposition into *oxalic* and *acetic* acids—On the transformation of *citric acid* (the acid of lemons and oranges) into *aconitic acid* (found in wolfsbane)—On the transformation of *malic acid* (which characterises the acid flavour of green gooseberries, apples, and rhubarb) into *fumaric acid* (the acid of common fumitory) and also into *equisetic acid* (the acid found in the marsh horsetail), and, lastly, into *asparagine* (the body found in asparagus and potatoes)—On the transformation of *uric*, *cyanuric*, and *cyanic* acids into *allantoin* (the substance found in the allantoid fluid of cows)—On the artificial production of *urea* (a substance which characterises the liquid secretions of man and of many other animals).

LECTURE IV.—FRIDAY, MAY 4TH.

"ON THE ARTIFICIAL PRODUCTION OF AROMATIC SUBSTANCES."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadowsweet*, *coumarin*, and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor*; of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

The lectures commence at eight o'clock, and are open to members, each of whom has the privilege of introducing ONE friend to each lecture.

The substance of these lectures will appear in the *Journal* during the autumn.

CENTRAL HALL OF ARTS AND SCIENCES.

The arrangements for erecting a Great Central Hall of Arts and Sciences at Kensington, on the ground purchased out of the profits of the Exhibition of 1851, having been carried so far as to secure the erection of that building, it has been thought desirable that members of the Society of Arts should be put in possession of full information on the subject, in case they should desire to invest in the property, before the whole of the available seats are disposed of. A copy of the prospectus is, therefore, forwarded to each member with the present number of the *Journal*, and the Secretary of the Society will afford any further information on the subject if applied to. A model of the Hall will be on view at the Society's house in a few days.

Proceedings of the Society.

TWENTIETH ORDINARY MEETING.

Wednesday, April 25th, 1866; Sir Daniel Cooper, Bart., in the chair.

The following candidates were proposed for election as members of the Society:—

Carrick, Robert, Chemical Works, Methill, Leven, N.B.
Taylor, Charles W., 167, Great Dover-street, S.E.
Whight, George, Gipping Works, Ipswich.

The following candidates were balloted for, and duly elected members of the Society:—

Brinsmead, John, 4, Wigmore-street, W.
Ellis, Charles Nicholson, 9, Tredegar-square, Bow, E.
Glover, George, Ranelagh-road, Pimlico, S.W.
Glover, George Raleigh, Ranelagh-road, Pimlico, S.W.
Head, John, Mill-street, Kidderminster.
Holdich, William, 105, Fleet-street, E.C.
Niemann, E. J., 19, Charlotte-street, Bedford-sq., W.C.
Pim, Jonathan, 22, William-street, Dublin.
Templeton, James, 7, Woodside-crescent, Glasgow.
Wilson, John C., 5, Lime-street, E.C.

The Paper read was—

THE PERILS OF MINING AND THE MEANS FOR PREVENTING THEM.

BY JABEZ HOGG, ESQ., F.L.S., &c.

Something like an apology appears to me to be due for my appearance here this evening as an exponent of the "Perils of Mining." When I say that to what is already known on this subject I can add but little from personal experience, I scarcely deserve your indulgence for the many shortcomings which will become apparent to many members of the Society during the reading of my paper. Indeed, I should hardly have ventured to occupy your time had it not been for the fact that in the course of my remarks I should have the honour and pleasure of introducing to your notice a refined application of science, one that I trust will be found of great practical utility, for indicating the presence of fire-damp in mines before it becomes dangerous from accumulation. My friend, Mr. G. F. Ansell, the inventor of this Fire-damp Indicator, has not only placed his apparatus at my disposal, but gives me his valuable assistance in demonstrating its various applications. I may first state that it is not my intention to go into the practical details of mining; indeed, to do so

would require an amount of knowledge of mining to which I have not the least pretension; my purpose this evening is rather to speak of the perils attendant upon the miner's work, and what may be done to reduce them to a minimum. I believe you will agree with me when I say that deaths cannot properly be said to be accidental, when the greater part of what are described in the Inspectors' Reports as "deaths from accidents in mines" arise from preventable causes, which a little more care and forethought on the part of the miners, and a little increased expenditure by the mine-owners, might have prevented. It is therefore clearly an error to speak of the greater part of them as *accidental* deaths.

By the great explosion at the Lundhill Colliery in 1857, it will perhaps be remembered that 189 lives were lost, and the Government of the day appointed Mr. P. H. Holland, to report officially on the loss of life. For five months this gentleman was employed before he could ascertain this positively, on account of the difficulty of recovering the bodies. During the time he was so engaged he gained much valuable information upon mining; and toward the end of the year 1859 the Council of the Society of Arts requested him to communicate his experiences "On the Prevention of Accidents in Coal Mines" (*Journal*, vol. vii., p. 37), and a very practical paper was followed by a valuable discussion. It was then argued that from the great increase in mechanical and other contrivances, the death-rate in mines in after years must become sensibly diminished. Mr. Holland showed one lamentable fact, that, exclusive of the miscellaneous fatal accidents, the average number of deaths from explosions for the eight preceding years rather exceeded one per diem. Well, I fear that not so much improvement has taken place as was then expected: for the death-rate is still very large, being six or eight times greater than that for any other dangerous occupation; and the charge of the insurance companies against death by accident in collieries is more than eight times the ordinary rate.*

"If," says Mr. Holland, "this destruction of human life were inevitable, it would be melancholy enough, but I shall convince you that a very large part of it is not inevitable, and that it would be very much diminished if the inspectors of coal mines could succeed in enforcing obedience to their regulations; and that obedience to those excellent rules would be far better enforced if it were made the direct and palpable interest of owners and managers of coal mines to observe and enforce them." In this year of grace, 1866, I fear we must reiterate the same sentiment, and say with this gentleman, that if we could *only* get certain good regulations enforced, what a blessing it would be, and how many valuable lives might be saved; but, sad to relate, very little progress has been made in this respect, and we have still to lament the want of co-operation between the miners and the mine owners, which practically nullifies the valuable supervision afforded by the Government.

All mining operations must, I fear, be necessarily attended with more or less peril, and the lives of the poor miners continually involved in uncertainty and danger; it therefore behoves all who have any influence to control these perils to use their best endeavours to ward off those elements of mischief which are calculated to produce such disastrous consequences. Improvements have been made of late years in the condition of labourers in all other branches of industry. Even the peasant [illegible] risen in the social scale, much as he requires still [illegible] before he can be said to enjoy a reasonable [illegible] comfort; but for the miner, whose occupation is [illegible] most dangerous and the most unhealthy, [illegible] little has been done. The public is still [illegible] tled (if it has not by now become inured to [illegible] appalling colliery accidents, and the miner is still [illegible] ignorance and peril, and has to fight [illegible] two terrible foes—fire-damp and choke-damp [illegible] liable at any moment to be burnt to a cinder, [illegible] beneath the *debris* caused by explosions [illegible] has little or no protection from being choked [illegible] some lair by the other. Irruptions of water [illegible] drown him like a rat in a hole; and perils in [illegible] other forms are ever impending over his [illegible]. Not that means do not exist of mitigating [illegible] not of altogether averting, the dangers [illegible] miner's calling; but these means are not [illegible] only in a meagre degree, and the miner him[illegible] ignorant—and superstitious and reckless because [illegible]rant—neglects or altogether refuses many con[illegible] and appliances contrived for his benefit and [illegible]

Mining, as we all know, is one of the most [illegible] operations carried on in Great Britain; upon [illegible] of the class who burrow in the bowels of the [illegible] win the riches buried there, depends in a great [illegible] the prosperity of several of the great industri[illegible] country, and the comfort of every individual [illegible] and therefore we are all, more or less, directly [illegible] in this mining question.

The coal and iron-stone mines of Great Britain [illegible] 3,220, and the computed number of males em[illegible] year 1864 was, according to the Mine Inspectors' [illegible] 307,542, and it appeared that of these one life [illegible] lost by accident during the year, and for every [illegible] tons of coal recovered and brought to the [illegible] life is sacrificed. In Mr. Wales' district the [illegible] number of iron miners is 3,900, and the quantity [illegible] stone raised, 450,000 tons; one life is lost for [illegible] persons employed annually, and 64,2[illegible] tons of [illegible] are raised for each fatal accident. It will [illegible] the per-centage of deaths in coal mines far [illegible] in iron mines, although, in my opinion, the [illegible] is much more efficient in the former than in [illegible]. It might have been expected that the [illegible] mines, owing to the increased appliances of [illegible] science, would have been freer from accidents [illegible] which have been at work for some time. [illegible] not the case, for we find the old-established [illegible] Scotland far better managed and freer fro[illegible] than those newly opened in South Wales, [illegible] latter have one man killed for every 277 coll[illegible] the former have only one for every 622, a [illegible] and deplorable difference. So many more lives [illegible] away in South Wales because the precaution[illegible] be effectual in West Scotland are not observed [illegible]. There is, however, another reason for this [illegible] difference; it is the fiery nature of the coal [illegible] the pits, Merthyr in particular; so that when [illegible]sion does occur, it is productive of the [illegible] destruction to life. Of this we had a melancholy [illegible] in the recent accident in the Gethin Colliery [illegible] lives were lost, and out of 60 persons work[illegible] pit at the time of the explosion only 13 [illegible] of some kind or other. Early in February [illegible] similar occurrence in this mine, which is the [illegible] in the district, was attended by still more fatal re[illegible] when 47 miners miserably perished. After a protracted and careful investigation made at the time, the manage[illegible]ment and system of ventilation* were particularly [illegible]

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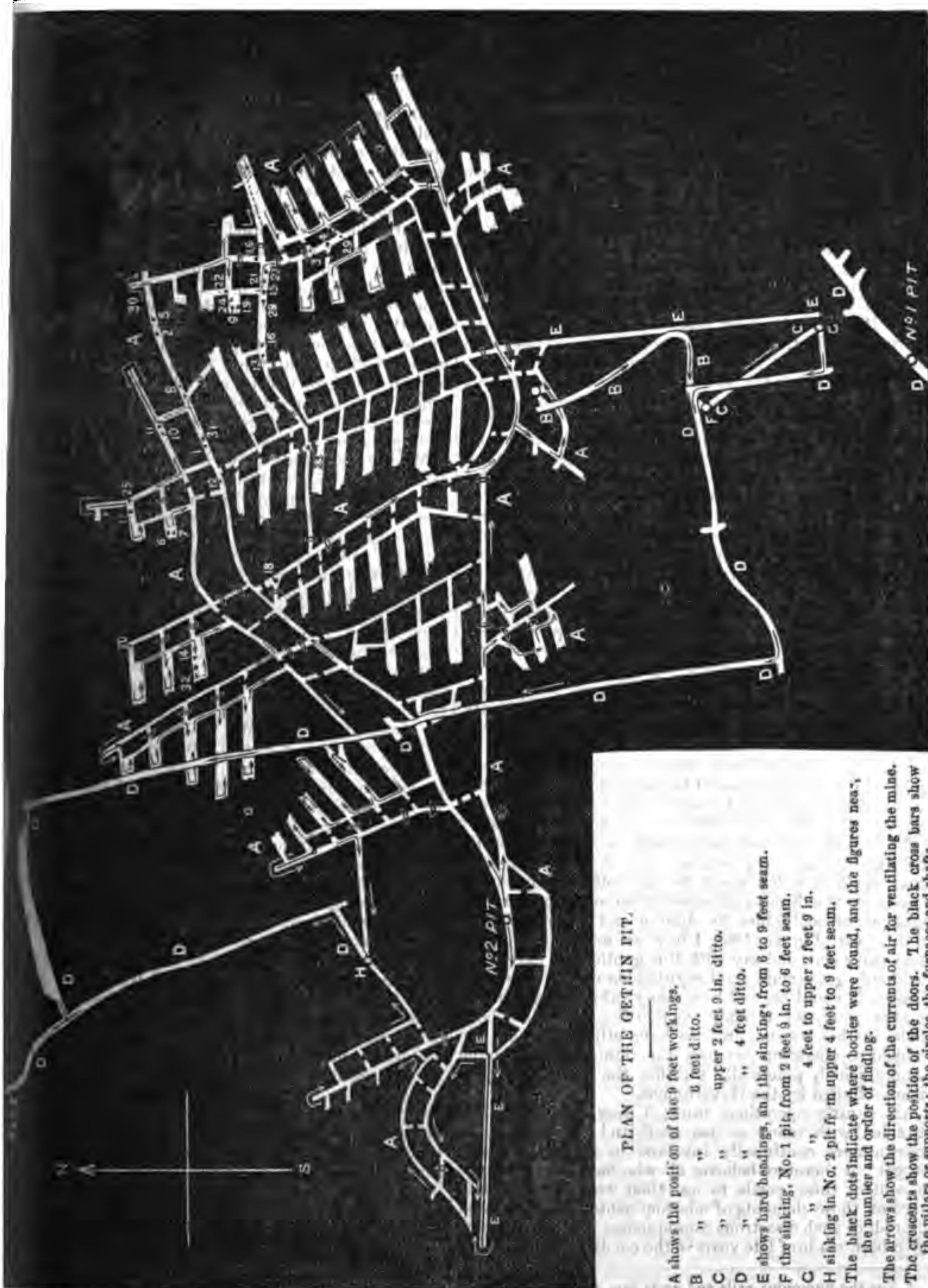
* For the numerous evils and great loss of life which occur in mines, Mr. Holland proposed a plan of life insurance, and argued that "such a system, by showing the men that their lives were valued, would lead them to value them themselves." Lord Campbell's Act can be rarely applied in colliery accidents, since it is absolutely necessary to prove that death resulted from the neglect of the defendant, that is, the mine owner; so that life insurance appears to offer the best means of meeting their cases, and especially so if the insured can arrange to share the profits of diminished accidents; for then "the motives to carefulness and good management would be still more increased."

* It is expressly enacted in the 4th section of the Colliery Inspection Act, that an "adequate amount of ventilation shall be constantly produced in all collieries, to dilute and render harmless gases to such an extent as that the working places of the pits and levels of such collieries shall, under ordinary cir-



PLAN OF THE GETHIN PIT.

A shows the position of the 9 feet workings.
B " " 6 feet ditto.
C " " upper 2 feet 9 in. ditto.
D " " 4 feet ditto.
E shows hard headings, and the sinkings from 6 to 9 feet seam.
F the sinking, No. 1 pit, from 2 feet 9 in. to 6 feet seam.
G " " 4 feet to upper 2 feet 9 in.
H sinking in No. 2 pit from upper 4 feet to 9 feet seam.
The black dots indicate where bodies were found, and the figures near the number and order of finding.
The arrows show the direction of the currents of air for ventilating the mine.
The crescents show the position of the doors. The black cross bars show the pillars or supports; the circles, the furnaces and shafts.

...named; nevertheless, so little were the lamentable results and the warnings heeded, that in less than four years we have to place on record an almost equally fatal catastrophe. The coroner who sat to inquire into the late accident said, in the course of his remarks to the jury, that, "according to the returns for the year 1864, there were no less than 101 separate accidents from fire-damp in the coal mines alone of the South Wales district, involving the loss of 105 lives;" and this estimate is exclusive of accidents in ironstone mines. When the number of these accidents is compared with the quantity of coal

... be in a fit state for working." It is, however, quite ... effect to this enactment, neither can it be ... extraordinary and sudden accumulations of ...

drawn, the average is greater than in any of the other ten districts into which England is divided, and more than twice that of the three principal ones, viz., Northumberland, Cumberland, and Yorkshire. The returns for the year just passed (1865) will present a more gloomy aspect. They have not yet been made up, but from my own experience I can safely say that the numbers in this district will be fearfully augmented, as I have already had in my division alone during the past year nearly 100 colliery cases, exclusive of the one on which we are now engaged. These facts are very melancholy to contemplate, and appear to indicate the necessity of some parliamentary inquiry, with the view of ascertaining whether some more effectual measures could not be adopted, and some improvement effected, and I sincerely hope that the legislature will be induced to take up the matter and institute some inquiry."*

Inquiry after inquiry has been instituted by the government; indeed, a committee of the House of Commons is once more engaged upon the subject. Unfortunately little good has hitherto resulted. No investigation can be of any use unless it is followed by more stringent rules, compelling those in charge to use more caution than is now customary. So essentially dangerous is the duty of the miner, that it is not to be wondered at that the caution which the presence of danger instils into most minds should not be very highly developed in those who have chosen mining as a mode of earning a living. If the officials in charge of a mine care so little for the results as to leave all to blind chance or next to it, since they consider their duty done when they have hoisted a danger-signal, it is not to be wondered at that the more ignorant workmen should err on the same side, and blindly walk into the very jaws of death with an open lamp to light them on their way. And, with but few exceptions, to a more or less culpable extent, carelessness is at the root of all the sad and terrible disasters attendant upon the firing of a pit. In addition, it must be remembered that the whole body of miners are fatalists of the worst class, implicitly believing that they will not die until their time comes, and that when it does, die they must, and hence they run most foolhardy risks. This belief, however, makes them courageous even to a fault in endeavouring to save fellow-workmen requiring help.

It will be well to enter a little more fully into the circumstances attendant upon the late explosion in the Gethin mine, as they are peculiarly instructive, and clearly show the wide-spread destruction produced by these gas accidents. By the kindness of Mr. C. H. James, I am in a position to make this quite clear. This gentleman visited the mine immediately after the accident, and carefully noted the position in which each corpse lay, as numbered and shown in the plan on the preceding page. This plan was produced at the Court of Inquiry, and, therefore, is authentic and truthful.

The Gethin mine is an extensive colliery, comprising several pits now connected together. There are two winding shafts, which are used as downcasts for supplying the workings with air, and they have one upcast flue in connection with them. No. 1, or the lower pit, is sunk to the 4ft. vein, and used for that and for the 6ft. working. No. 2, or the upper pit, is sunk to the 9ft. vein, and is used entirely for that vein. The explosion took place here, where the ventilation is split into different portions. Ventilation is carried on by means of two furnaces (circles shown in plan) situated near the bottom of the flue pit. The length of the current of air which supplies the No. 1 pit is about three-quarters of a mile, while that of No. 2 is about a mile and a quarter; this is a good deal increased by the splitting up it undergoes in supplying the various stalls. The 9ft. coal is worked by pillar and stall, as you will see by the plan. The coal in this district dips, as a rule, at the rate of 3in. per yard to the south. The pit is sunk in such a position as to have the coal to be worked lying to the "rise," or north of the pit. When the coal is won, levels are driven from the pit east and west; from these level headings, [illegible] headings are driven to the north or rise every 60, 80, or 100 yards, and from these the stalls are turned. The headings are about 7ft. wide, and, in all cases, high enough for a horse to travel along. The stalls vary considerably in width, ranging from six to 20 yards, according to the thickness of the seamstep. The pillars, or coal left between the stalls, varies from 12 to six yards wide, the communications between the stalls being [illegible] cross-holes or thirlings. The arrangement of the seams is as follows;—The upper 4ft. is the upper [illegible] on the plan; 20 yards or so below is the upper 2ft. [illegible] five yards below that is the 6ft.; and 30 yards [illegible] again you have the 9ft. The ventilation was app[illegible] all correct up to December 15th, when, for some [illegible] or other, a change was made in that portion of the [illegible] where the accident occurred, and the consequence [illegible] that in a couple of days a considerable quantity of [illegible] damp accumulated at this part of the workings; [illegible] although the foreman thought it dangerous, and [illegible] "the danger-signal put up" (which consisted of [illegible] two cross poles) to warn the men of the danger, [illegible] was no one's business to see that the gas was driven [illegible] or any great change made in the current of air: and [illegible] have it in evidence that the man in whose stall the [illegible] first began to accumulate was a steady workman of [illegible] 20 years' standing, fully aware of the danger atte[illegible] the accumulation, as, indeed, were many of his [illegible] workmen, for, as one of them said, "it was so full [illegible] there was enough fire to blow the pit to pieces." [illegible] however, went to work as usual, hardy, rash, and [illegible]less, and in about an hour after a workman said he [illegible] a ringing noise in his ears," when he started up [illegible] shouted out "the damp is off," and the last sight [illegible] met his eyes was a man blown into the "sump" (the [illegible] end of the shaft), and stones went flying about in all [illegible]tions. In a moment, the already long catalogue of [illegible] and death was increased by the loss of 30 strong [illegible] the heartrending wailings of widows, orphans, and dependent relatives, to the number of 81.

Mr. Brough, the government inspector, [illegible] while underground with Mr. Wales, [illegible] the cause of this accident, "they met a [illegible] boy going in with an unlocked lamp, [illegible] than one lamp found after the explosion was [illegible] unsecured. The colliers are permitted to buy their own lamps, manufactured anywhere; whereas, if the owners were to supply all the lamps, they would, in all probability, have them carefully made by the best makers. The ventilation, also, although he could scarcely say it was insufficient, had to travel in out in various directions and through intricate and tortuous underground pits or staples; so that only in the event of all going smoothly and remaining in a perfectly sound condition,

* This year promises to supply a list of casualties equal to former years. A fearful explosion happened on January 27th, 1866, at the Highbrook Colliery, near Wigan, which occasioned the loss of 30 men and boys. On the morning of the accident the fireman, William Marsh, reported the mine as free from gas, and about 50 labourers descended as usual to their work. All was well till noon, when the foreman went to the "pit's-eye" to get something to eat. On his way back to the far workings he was met by a blast of wind coming along with such violence as to lift him off his feet. The underlooker, Henry Ascroft, was down in the other pit at the time, but he joined Marsh in a few minutes, and an examination of the workings was made. As they were proceeding they stumbled across three boys, two almost in the last stage of suffocation, but they quickly recovered on being conveyed to the fresh air. A short distance further an arch over the return air course was found blown down, completely stopping the whole ventilation beyond that point. This was about 140 yards from the pit's-eye and 240 yards from the end of the working. About two hours after the accident the first dead body was found and forwarded to the bank, where, before night, there was a hideous row of 30 blackened corpses. The cause of the explosion is, as usual, enveloped in mystery, as all those who perhaps could have thrown any light upon it were silenced in death.

could this mine preserve its proper balance, and be said to be prepared to meet a sudden danger. Even after the accident, three accumulations of gas were found, one in a hole in the roof of the middle level, and the others in two old stalls, and no attempt had been made to remove them. Indeed I was informed," continues the inspector, "by the officials of the pit who accompanied me, that they had not known of these accumulations until after the accident; and although, at the time of my visit, the air was travelling from these dangerous spots to the working-stalls, the men employed there were still 'firing shots,' *i.e.*, blasting with gunpowder."

So much for the care exercised by those in authority over this fiery mine at Merthyr; indeed Mr. Brough's last report fully bears out what has been stated with regard to the difficulty of guarding against sudden accumulations of gas, because of acts of gross carelessness on the part of those in charge of even well-regulated mines. In another instance, Mr. Brough tells us that the "haulier" left doors open which turned the air in another direction, after the workmen had left off work for dinner, thus changing the current for one hour only; during that time a considerable quantity of gas accumulated in the workings, and upon their return, the men, not knowing what had been done, entered the workings with naked candles; an explosion which killed four of them immediately ensued.

We will take another case from Mr. Wales' report, because it forms a contrast to the last one, which might be said to be hardly a fair illustration of pits in general, as it was known to be of a dangerous character. This explosion occurred in a mine belonging to the Aberdare Iron Company, Glamorganshire, which is described as by no means a *fiery vein*, and therefore excepting where ordinary measures for safety are entirely set at nought, such an accident ought never to happen. The part of the mine in which this explosion happened was in course of rapid extension through a large fault, and the quantity of air passing through was very small indeed, not more than 2,000* cubic feet per minute, and this was borne round the whole of the workings in one continuous current, thus necessitating the use of several doors, none of which were doubled, so that even this very bad ventilation was liable to be cut off either by neglect or injury done to any one of these doors at any moment. It came out in evidence, also, that no examination of the workings had been made previous to the workmen going into their stalls, in one of which an accumulation of gas had unexpectedly taken place. A workman entered this place with a lighted candle, and the gas was instantly ignited, and he, with two of his fellows, were killed. Now, it will scarcely be believed that in this instance the defective arrangements in the mine were duly communicated to the proper quarter, and yet nothing was done to avert the evil; the men were allowed to work either with safety lamps or naked lights, just as they thought fit. So that we see, on turning to any of the inspectors' reports, that precautions and regulations are openly set at defiance or systematically neglected, and that a very large proportion of the hundreds annually killed in mining are culpably destroyed in consequence of such neglect.

It must not, however, be supposed that by the enumeration of losses of life by fire-damp we fully realise the extent of the evil going on year after year; it appears that the gross total of actual deaths in 1864, from accidents in and about the coal and iron mines of Great Britain, was 963. The following tabular arrangement shows at a glance the every-day dangers of miners:—

Deaths.—In the Shaft.

From overwinding; that is when the engine is not stopped in time, and the tub being drawn over the pulley, the miners are thrown bodily down the shaft	8
From falling, either from the surface or from part of the way down the shaft, *e.g.*, as where the same shaft works two seams of coal or ironstone	63
From things falling all or part of the way down the shaft	22
From breaking of ropes or chains; that is, the ropes or chains which raise and lower the tubs, cages, &c.	19
From accidents while ascending or descending, such as from falling off the tub or cages, or being struck by the return tub	54
From miscellaneous accidents in shafts	46
Total in shafts	212

In the Pit.

From explosions of fire-damp	101
From explosions of gunpowder	20
From suffocation by gases	11
From falls of coal or ironstone; that is, falls of detached masses which are imperfectly propped, or which fall before expected	133
From falls of roof; that is, fall of stone from the roof or sides of the galleries	305
From miscellaneous accidents underground	108
Total in pit	678

On the Surface.

From machinery	15
From bursting of boilers	10
From miscellaneous accidents on surface	48
Total on surface	73

Grand total in all parts of mines 963.

The numbers in this table need a word of explanation, for we see it stated that the actual number of deaths from fire-damp was 101; but it must be understood that deaths after removal from the pit, which amounted to 20, although resulting from explosions, are not generally included in this list by the inspectors; nor are deaths from suffocation by after-damp, and the gases liberated by blastings, which amounted to 11, and are included amongst the miscellaneous accidents. Neither can we form the least idea of the very large number of workmen maimed and injured for life by explosions. Mr. Atkinson, speaking of the serious personal injury occurring from non-fatal accidents, says:—"The reports received are of little value in a statistical point of view, for besides the persons injured by slight explosions of gas, 17 other non-fatal accidents were reported, by which three deputies and seven other workmen were injured by falls of stone, and one person crushed by a coal tub. Four persons were injured by the breaking of a winding-rope, while they were ascending the shaft, and two others suffered injury by being jammed by coal trucks and waggons on the surface railways, near the tops of shafts." Mr. Brough gives a list of 197 accidents to 92 persons killed. "This account," he observes, "of deaths, contusions, fractures, amputations, &c., sounds more like the description of a battle-field than the ordinary report of industrious and peaceful pursuits; nevertheless, year after year, the same melancholy record has to be made out and submitted to public notice." Among the miscellaneous accidents in Mr. Baker's report, there is one which so fully illustrates the proverbial carelessness of the workmen that I cannot refrain from quoting it:—"The store of gunpowder used for blasting was kept in the blacksmith's shop. One day, when filing a piece of red hot iron close to the chest in which he had placed a barrel containing 28 lbs. of gunpowder, a frightful explosion occurred, which rent the chest asunder, razed the shop to its foundations, and injured the man so severely that he died a few days afterwards." Most culpable accidents arise from falls

* The average quantity of air passing through the House of Commons is 9,000,000 cubic feet per hour.

down the shaft. Only just think of the mouth of a pit yawning before you without any kind of protection round it. Mr. Baker furnishes the particulars of a very remarkable accident arising from this neglect in one of the South Staffordshire mines. A horse was being harnessed in a stable near the pit, when he suddenly became restive, knocked down his attendant, and bolted out of the stable, making directly for the open shaft, down which he went. Unfortunately six workmen were at the time descending; the horse fell upon them, precipitating the whole to the bottom, a lifeless heap.

The large number of deaths from falls of roof and coal are due to imperfect inspection, or to too close working; a good deal of course must be due to the want of skill on the part of the miner. The successful introduction of coal-cutting and boring machines, driven by compressed air, will prove a valuable means of prevention of accidents of this nature, and go far to increase the safety of the men employed in driving-headings; besides which it will at the same time incidentally assist the ventilation, by the escape of the used and liberated air at the point where a purer atmosphere is most needed. In an economical point of view machinery must prove of importance. For instance, in undercutting coal by hand the opening must be wide in front and about three feet deep, or it will be impossible to get at its inner portions; the coal thus removed by the miner is so small as to be almost valueless; whereas, when the cut is made by a machine it is so narrow that a great saving will thus be effected. As soon as the cut is sufficiently deep the coal falls by its own weight, or is forced down by wedges; but should it fall suddenly there is no danger of crushing and burying the miners alive.

But accidents are not the only evils with which the miner has to contend. His occupation is itself unhealthy, and, as at present conducted, involves a serious curtailment of his natural period of existence. The atmosphere he breathes is impure; the positions in which he labours are irksome and injurious; and the incrustation of his skin with dirt is deleterious. The result is, that in Cornwall, between the ages of thirty-five and forty-five, fourteen miners die for every ten workers above ground; between forty-five and fifty-five, thirty-four miners perish for every fifteen workers above ground; and between fifty-five and sixty-five, no less than sixty-three miners succumb for every twenty-four toilers on the earth's surface. All these calculations deal with males only; but, as it seems females are also employed in considerable numbers underground, the mortality must be still greater in proportion among them. And if we dive into the every-day life of these people we shall cease to feel surprised either at this lamentable death-rate or at the deterioration of health that must of necessity occur in an underground existence.

"In deep cold metal mines, where a few narrow pits open about the same level, stagnation is the rule.* If the average temperature inside be 60° and outside 61°, there is nothing to lift the lowest stratum of air. There is no din, no rattle, no movement here; a dull, sleep-creating sound comes faintly in from a big water-wheel, which is slowly turning and pumping water up from a neighbouring hole. The only cheering sound about the place is the rattle of hammers and stones outside, where boys and girls and strong-armed women are smashing and washing ore in sunlight and fresh air; their cheeks are ruddy, and their eyes bright; but down in the dark well are sickness, silence and gloom." * * *

"On the floor of a coal-mine the footing is sure, but not so in a metal mine, as here the passages, being made at different levels, are full of pitfalls. When the level is reached, a miner leads the way, and an incessant cry is taken up and passed along of 'heads,' 'shoot,' 'lump,' 'deads,' &c., as certain dangers are approached and passed, and in a short time everyone is wet, hot, greasy, smoky, and muddy."

* J. F. Campbell's "Frost and Fire," vol. i. p. 54.

"Having driven two long caves, one above the other, so far that candles will no longer burn at the ends, and men can hardly breathe, the next step in metal-mining is to 'rise' and 'sink,' and join the caves; to make a passage for air to move through, if nature so wills. It is easier to rise than sink, for loose stones fall when blown out of the roof; and the stones which are quarried at the top are thrown down, and gather in a conical heap below, so that the place is well called "a close end."

"In order to get oxygen into this black hole a small boy is stationed at some place where the air is thought fit for use, with a circular fan and a leaky tube. Air of some sort is driven to the end, and half-choked men and dim candles struggle on for life in the burrow. The only air-engine found working in one big mine was a piston in a rough deal box, a panting, short-armed little boy pulled and pushed at the cross handle. The air was close where he worked, and the squirt and its pipes leaked. A long way off, at the end, a very faint puff, which gently bent the flame of a candle for a moment, was the sole result of each violent effort. Three men and three candles were spoiling air thick with old powder smoke, and the place was suffocating, for the boy himself consumed more air than he supplied. He could have blown a candle out with his mouth, he could not with the air-pump. The heat of the men and their lights moved more air than this engine of one-boy power. One effect of these close ends, on one who is unused to them, is to cause perspiration to break out freely while standing still or sitting quietly, although the thermometer marks 64° or less. There is a feeling of tightness about the neck; the chest heaves with a gasp instead of rising steadily; and generally there is distress and a feeling like nightmare. Men at work in bad places pant and seem to breathe painfully; their faces are red or purple; their veins swelled; their brows wet and begrimed with soot. They seem to labour hard, though their work is not harder than quarrying stones elsewhere. In such places candles flicker, and sometimes go out altogether; no puffing or drawing will light a pipe or keep it lighted. There is no laughter, no fun; no busy cheery clatter of active labour at close ends; there is silent toil, for carbonic acid gas is not laughing gas." * * * * *

"To return to upper air fom the bottom of a deep mine, the amateur miner follows his guide up perpendicular ladders, perhaps in the pumping-shaft, with the rods moving up and down a few inches of his back, and foul mine-water dropping on his head, and at last emerges greasy, muddy, drenched, streaming with perspiration, with throbbing eyes, giddy and gasping like a fish out of water, and when the trap-door is passed, the first long draught of the clear, pure air of heaven seems too strong, it flies to the head like brandy; even miners who are used to such places often stagger and reel like drunken men." Such is the condition of a Cornish metal mine.

As regards remedial measures it seems clear that all accidents arising from breakages of machinery, faulty construction of shafts and workings, carelessness of management and recklessness of the workpeople, are certainly preventible, and therefore ought to be dealt with by the punishment of those who are responsible for the observance of the proper means for their prevention. No doubt systematic inspection has induced the adoption of many precautionary arrangements, and thereby hundreds of human lives have been saved; but this has not produced all the improvements of which mines are susceptible, and from the very nature of the case it never can. Making proprietors of mines personally responsible for their parsimony or want of due diligence would go far to check the description of accidents just alluded to; and this should certainly be done. No man has a right to jeopardize the lives of others in order to save himself trouble or expense. Then, again, much good may be done in lessening the amount of the present evil, if some trouble were taken to instruct the workmen as to the

[illegible] of the dangers which beset them, and thus to induce them to use all possible means of precaution.

Science has provided us with weapons with which to combat such potent demons of the mine as fire-damp and choke-damp. For the first there are the Geordie and Davy-lamps, which, if properly constructed and carefully handled, not only indicate danger, but may avert the consequences; but the lamps, though valuable, are at best but imperfect protectors, as I shall presently show, but they are often ill-constructed, and still more frequently are carelessly handled. The light they give is feeble, and this is made so much worse by bad ventilation that the miners are frequently induced to tamper with them. There is likewise now offered for the benefit of miners and mineowners, the simple and beautiful "fire-damp indicator," invented by Mr. Ansell. With this instrument the smallest per-centage of either fire-damp or choke-damp is immediately detected. But before we enter into this part of the question, let us first glance at what is done for mines by ventilation; and then endeavour to comprehend the nature and properties of the gases which accumulate to a dangerous extent.

The ventilation of mines is obliged to be carried out artificially, although, of course, in obedience to known natural laws; the method is by heating air in one shaft, and letting cold and fresh air be drawn down another, or by dividing a single shaft and turning the furnace up one side. By partitions, doors, screens or brattices, a downward current is made to flow wherever it is wanted to dilute and carry off noxious gases, and at the same time supply men, horses, lamps, and fires with air, without which they cannot breathe or burn. We have just seen what a bad system of ventilation does for the Cornish miner, or rather what it does not do; [illegible] give him a sufficient supply of oxygen to maintain him in health and strength.

The proper ventilation of a mine has always been a [illegible] subject to deal with, since it is constantly liable to all kinds of disturbances and impediments. In some [illegible] the ventilation is entirely effected by what is called the natural heat of the mine; in one of the [illegible] pits, left for six years to self-ventilation, the [illegible] the current was strong enough in winter to blow [illegible] lights, but as summer advanced and the temperature of the surface increased, the force of the current [illegible] diminished, until it became inapplicable, and [illegible] artificial heat had to be employed. The only [illegible] gas to deal with in this mine was constantly [illegible] carbonic acid. In the Tyne Main Colliery the natural heat at one time produced a draught [illegible] cubic feet per minute; nevertheless with this [illegible] draught of air this mine has not been free from [illegible] accidents. We see, therefore, that natural, or [illegible] ventilation is not to be depended on, for the very [illegible] that, in hot weather, the downcast draught is [illegible] the same as the upcast, and the weight, or pressure of the two columns of air is so nearly balanced [illegible] ventilation comes to a stand-still.

Mr. Atkinson, in the report of his inspection of the [illegible] Colliery, in July last, said that he found the ventilation of the mine most insufficient, chiefly because, owing to the hot weather, the air descending the downcast shaft was nearly as warm and light as that ascending the upcast; and that in consequence of firing shots, the great increase in the quantity of stythe or carbonic acid, and the absence of oxygen, lights burned [illegible] and the men could not proceed with their work.

There was passing through the Lundhill Colliery a [illegible] quantity of air to take away a quickly accumulating amount of gas, but too late the discovery was made that the current was altogether inadequate to effectually clear out every part of the mine; and consequently one fatal morning the mine was fired, [illegible] lives were lost, and £20,000 worth of property destroyed. At Risca and Cymmer a large current was [illegible] at the time of the well-remembered loss of life in those mines. It is then quite apparent that unless a sufficient quantity of air can be sent into a mine and made to split up and reach *every* part of it the ventilation will be imperfectly carried on. The object to be attained in every mine is to divide an accumulating amount of gas, and not only remove it quickly and perfectly, but, as far as possible, in separate currents. From the difficulty of doing this, it happens that "close ends" abound in nooks and corners of mines in spite of "windyrings," "windylators," "fans," and "water-blasts."

A good deal more might be said upon this practical part of our subject, but it would only bring us to the same conclusion, that the best method of ventilation is unequal to meet all the difficulties of mining operations, such, for instance, as "blowers," by which is meant a cavity in the coal that has served as a receptacle for collecting a considerable quantity of gas, which is instantly liberated by a stroke of the pick; or again the chance breaking in upon old workings, which, having been closed up for years, accumulate an immense quantity of gas; or, the gas having collected in a "*goaf*," is retained there by the high pressure of the atmosphere as indicated by the barometer. Suddenly the barometer falls, the mass of gas expands, and some unfortunate workman, not knowing what has happened, walks into the danger with a naked light, thereby exploding it may be acres of gas. Indeed, it is out of the question to make a system of ventilation so perfect as to meet all the hidden dangers of different times and seasons.

Fire-damp is inflammable, burning with a luminous flame, and in its combustion forming water and carbonic acid. A mixture of fire-damp and air, containing six per cent. of the gas, burns quietly; if the quantity of the combustible element be increased to seven per cent., the mixture explodes feebly; the most destructive explosion taking place when ten and a half parts of fire-damp are mixed with eighty-nine and a half of air. Fire-damp, fortunately, requires a high temperature to ignite it, but by its combustion it produces a still higher one; consequently it singes off the hair, burns the skin, sets fire to garments, and at times even to coal; hence we occasionally hear of mines being on fire. The gas has a peculiar odour, which, however, varies considerably; in some mines it has a faint smell of alcohol, in others of tar, and again in others it has a fetid odour not unlike fennel. For experimental use it is readily procurable, being eliminated when a mixture of equal parts of acetate of potash, caustic potash, and quick lime is strongly heated. It occurs naturally as a result of the decomposition of vegetable matter contained in the mud of stagnant water, such as rivers, ponds, marshes, &c.; hence its name marsh-gas. The explosive power of this gas, and its capacity for dealing out death and destruction far and wide, may be gathered from the scientific evidence adduced at the time of the Hetton Colliery explosion, December 20, 1860. It was pretty accurately ascertained that the flue in which the accumulation of gas occurred held 7,000 cubic feet of fire-damp. This quantity of gas, when exploded or ignited, expands into 56,000 feet, and is then immediately converted into after-damp. The temperature of the gas on its ignition is raised to 1,500 degrees Fahr., that is, to a bright red heat; and the explosive force of such a quantity of gas as I have just mentioned is equal to that of 1,875 lbs. of gunpowder. Gas is pressed upon in the workings by the great weight of the atmosphere, therefore to take off the pressure is to liberate the gas; and as the pressure of the atmosphere may be one day equal to 15 lbs. to the square inch, and the next to only 14 lbs., it will be seen that from this cause alone a mine may be well ventilated one day, and the following only imperfectly. The miner, when he sees a cloudy, wet morning, says, "Ah! I shall not be able to work to-day," and goes to the mine with a heavy heart, and there finds the accumulated gas too much for him; nor will the best ventilation "sweep it out" in a hurry.

It is well known to those accustomed to mining

operations that there are three kinds of gases met with in mines, all of which are most destructive to health and life, and their nature should therefore be clearly understood in dealing with the important question of the perils of mines. First, the *fire-damp*, or light carburetted hydrogen, which ascends to the top of the workings; secondly, *white-damp*, which is a mixture of 8 parts of nitrogen with one of carbonic acid; and lastly, the [illegible] *black*, or *after-damp*, which is carbonic acid alone, and which, from its weight, occupies the floor of the mine. The carburetted hydrogen is much lighter than common air, a cubic foot of it weighing only a fraction more than one cubic foot of air; therefore it spreads over the roof of the mine and overflows into the workings, especially, as before stated, during certain changes in the weather. The choke-damp, from its great specific gravity, settles down on the floor, and unless the air is passing through the workings with considerable velocity, there it remains, like mud in water. The carbonic acid in mines, as well as in every-day life, "increases with the activity of life, and with artificial warming and lighting, as well as by animal and vegetable decay. It follows us everywhere, living or dying, and we can only get rid of it by keeping up the natural currents of the air. It is [illegible] the capacity of the air to support life or combustion diminishes regularly in a manner more consistent with the idea of the activity of the acid than the absence of oxygen."*

Another important element in the deterioration of health arises from the variable quantity of oxygen found in mines. Dr. Angus Smith says:—"In sitting down with the workmen at the end to compare the sensations of breathing above and below ground, I soon found that air having the normal quantity of oxygen and carbonic acid was quite the exception." Mr. P. Moyle examined the air of the Cornish mines and found them all deficient in oxygen; the average gave three per cent. below the requirements of a health-giving atmosphere, with, of course, a proportionate increase of nitrogen and carbonic acid. By continually breathing such an atmosphere affections of the lungs ensue, and the miners' "disease of the chest" carries off its victims by scores annually.

The miner himself begins to think the air poisoned and unfit for breathing when, after having enlarged the wick of his candle, it nevertheless flickers and goes out; for a candle will not burn in an atmosphere containing 3 per cent. of carbonic acid with less than 18 per cent. of oxygen. "I have been informed," says Dr. A. Smith, "by Cornish miners that they have worked in places where it was impossible to remain more than ten minutes at a time, for the candles went out, and nearly every man fell down exhausted." Only think of such a frightful state of things, and the damaging effect upon health.

"When the inspired air has the same composition as that which is exhaled, the object of respiration is no longer attained; for the expired air is used up, and cannot a second time perform the same function in the lungs. The venous blood is no longer changed into arterial, and difficulty of breathing and suffocation soon follow, just as if the mouth and nose had been closed."† The influence of a free supply of good air may be, perhaps, more readily appreciated when it is understood that the lungs constantly require, and, indeed, receive, on an average, 20 cubic inches of fresh air at each inspiration, that is, about 400 cubic inches per minute, during which time as much as 150 ounces of blood are propelled through them. The daily requirements of the human machine are about 38 hogsheads of air and about 25 hogsheads of blood. Another most important fact must be taken into consideration, that the blood as it circulates has in itself no power of selection, but absorbs poisonous matters of any kind if they happen to be present in the atmosphere.

Nor must we overlook another source of evil, which is to be found in the organic matters floating about in mines. If, as you approach the entrance of a pit, a gleam of sunlight happen to play across it, you will at once perceive an immense quantity of solid matter issuing forth in an endless stream. The impure air of the mine is loaded with these solid particles, which, when caught and submitted to microscopic examination, are found to consist of fine particles of coal, crystalline bodies, filaments of organic matter, [illegible] mines, in addition, fine portions of [illegible] from gunpowder explosions, arsenic [illegible] saltpetre and sulphides of various [illegible] I tell you that, with a given amount of inspired air the miner takes into his lungs from 60 to 80 grains of [illegible] impurities during each day's work, it will be readily understood that these matters must [illegible] exert a very injurious effect upon the lungs as well as the other organs of his body. The inhalation of [illegible] particles might easily be prevented by the use of a [illegible] respirator, made of a layer of cotton wool placed between fine wire gauze; this could be made for [illegible] pence.

The liberation of many of the solid products enumerated above might be prevented by the substitution of gun-cotton for gunpowder, and by using Professor Abel's fuse instead of the present dangerous [illegible] careless mode of firing the charge for blasting, [illegible] to life or limb is often occasioned. This fuse is fired by a simple form of magneto-electric machine, and the time of firing can be regulated with the greatest precision, and the distance from the charge be increased at pleasure.

Until the beginning of the present century, the only means of ascertaining the presence of fire-damp to a dangerous extent was at the imminent peril of igniting the whole, while the dim light afforded by the steel-mill was the only one with which a dangerous atmosphere could be approached, and even with this [illegible] was the actual danger of the sparks given off igniting the gas. In 1812, the insufficiency of the then existing arrangements was made painfully apparent by the Felling Colliery explosion; the fact of a pit [illegible] worked, and, as was supposed, adequately ventilated, being subjected to so extensive a calamity as to cause the loss of three-fourths of the large staff of workmen employed in it, led many to make the most earnest endeavours to devise some remedy for the evil. The first recorded invention in this direction was a lamp, devised by Dr. Clanny, capable of being burnt in an explosive atmosphere. This consisted of an arrangement for blowing the air to support combustion through a column of water, and for permitting the escape of the heated air through the same medium. The lamp which is now called the Clanny Lamp bears very little resemblance to the original, it is somewhat like the old Geordie [illegible] one on the table, found after the Gethin explosion. At length Sir Humphrey Davy turned his attention to the subject, and found, while pursuing his remarkable "Researches on Flame," which after a time led to the invention of the Safety Lamp, that no explosion could be produced in a mixture of air and fire-damp passing through narrow tubes, owing to the cooling influence exerted by the tubes upon the gas, and that the narrower the tube the shorter was the length required to produce this protective effect. Hemming's safety tube for the oxyhydrogen blowpipe depends for its efficacy upon the cooling influence which the metallic tubes [illegible] exert upon the burning jet. The heat of the flame is in this way prevented from passing backwards, and causing the explosion of the mixed gases in the [illegible].

Flame is well understood to be (in all ordinary cases) a luminous envelope, which forms a limiting surface between the unburned combustible within and the supporter of combustion without. It is important to impress this fact upon miners—that on the approach of the flame from an explosion, which can sometimes be

* Dr. Angus Smith's "Reports on the Air of Mines."

† Liebig's "Letters on Chemistry."

seen to come from a distant point, they might, by instantly lying down in the centre of the tramway, allow the flame to pass over them, then, by quickly recovering their position avoid the choke-damp, and thus save their lives. This, I believe, has been more than once the way in which many a miner has managed to save his own life amid almost universal destruction.

It is well known in the laboratory, that, by using wire gauze, we may easily cut off the upper part of a flame, the unburned gases being reduced in temperature below the point required for ignition; and if we employ a piece of gauze with about 400 meshes to the square inch, the conducting power of the metal is sufficient to cool the flame below the point of ignition, even though the wire itself may become red-hot. In a similar manner gas above the gauze may be kindled, and the flame will not pass through to that below.

Sir H. Davy, in the construction of his miner's lamp, skilfully adopted these principles, so that the miner might carry on his work without allowing the flame to come in contact with the surrounding atmosphere. The wire gauze used in the construction of these lamps contains from 700 to 800 meshes in the square inch. In a strong current of air, the heated gas may be blown through even this fine gauze, and thus suddenly cause an explosion; but, of course, such an occurrence can be easily guarded against. The lamp itself is merely an ordinary oil lamp, inclosed within a cylinder of fine wire gauze; it is provided with a double top, and a hooked wire, which passes up tightly through a tube piercing the body of the lamp, for the purpose of trimming the wick without the necessity of removing the wire case. When such a lamp is introduced into an explosive mixture, the flame is seen gradually to enlarge as the proportion of the gas increases, until at length it fills the entire gauze cylinder; when the gas is greatly in excess, the lamp is entirely extinguished; if quickly removed from the mixture while the cylinder appears full of flame, the wick is rekindled. Whenever this enlarged flame is seen, the miner should withdraw, though no explosion may be looked for while the gauze is sound; yet at a high temperature the metal soon oxidizes, and then easily breaks into holes. In this case, a single aperture of sufficient size determines an explosion.

The means employed for detecting fire-damp are few and simple. The viewer or his deputy is bound to inspect all the workings before the men are allowed to begin work, and with his Davy lamp determines whether it is safe for the men to use naked lights, or the safety lamp. In the latter case, the lamps are supposed to be securely locked; but even this regulation is set at defiance, for the men will at times suck the flame through the wire gauze to light their pipes, and by this selfish act they hazard their own lives, as well as those of their fellow-workmen.

In the viewer's trial, he reduces the flame of his lamp to about the size of a horse-bean, and then slowly raises it into the suspected atmosphere, carefully watching the flame. If there be three per cent., a pale blue cap overhangs the flame; if more than five, but less than seven per cent., the flame elongates in proportion to the quantity; if more than seven, but less than fifteen per cent., the lamp explodes (that is, the gas within the gauze) with less or greater violence; if the mixture contains more than fifteen, or sixteen per cent. of fire-damp, it burns quietly; and if more than this, it is unable to support combustion, and the lamp is extinguished. In former times these trials were made with a naked candle, and an explosion commonly told of the presence of the gas; even with the Davy lamp, in competent hands, these trials are not actually safe, as is evidenced by the report of Mr. J. J. Atkinson, of the Newbottle Colliery, wherein he gives two instances of explosions through the gauze of Davy lamps, which were found in perfect condition after the accidents. These were common Davy lamps. Many important precautions are required before using a new Davy lamp. The wire, at the time of its being drawn out, is lubricated with oil to enable it to pass through the steel die which regulates its size, and it is found that it retains on its surface a thin film of this oil, even after it has been woven into gauze. If, therefore, a new lamp is taken into an explosive mixture, the ignition and combustion of that mixture heats the gauze to redness, and the oil volatilises and ignites the fire-damp outside the lamp.

To fully comprehend, then, the advantages and disadvantages of the Davy lamp, we will take them *seriatim* :—

1. The fire-damp will explode through the gauze of a perfectly constructed lamp.

2. The lamp goes out if taken into a very impure atmosphere, and this happens in cases where light is absolutely necessary to the saving of life, or where there are urgent works to be conducted in an atmosphere which will support life for a short time, but where the Davy lamp will not burn. On this ground it is to be hoped that a means will be found of using the electric light in some way or other, either in Dumas' form or in that of the diver's lamp.

3. The Davy lamp may be, and indeed, as we have already seen, often is, opened by the miner, even after it has been locked by the viewer, either to light his pipe, or to obtain more light, for the gauze sadly obstructs light.

4. It may easily be extinguished by a current of air, or by a drop of water falling from the roof of the gallery.

5. If the lamp be tilted on one side, the oil is liable to run over the gauze; and in such a case, as not unfrequently happens, it causes an explosion.

We must not, however, lose sight of the fact that in spite of the disadvantages just enumerated, the Davy lamp has proved of very great value to the miner. Many changes and alterations have been from time to time proposed for the purpose of overcoming some of the objections above mentioned, but hitherto, all the proposed improvements have ended in disappointment and failure.

The Stephenson lamp, or, as it is popularly termed, the "Geordie," has its own peculiar advantages and disadvantages, which have been variously estimated by those who have used it. Its chief value is, that it is so constructed that the moment an explosive gas reaches the point of the flame it is extinguished, so that the miner cannot work on until the gauze becomes red hot. The flame is protected by a glass cylinder within the gauze; but should this be broken by accident, as sometimes happens, and the man continue to work on, they have rather less protection than with the Davy. The workmen object to the "Geordie" because of its greater liability to accident; when accidentally extinguished, they must go in search of the foreman, or make their way to the pit's mouth, which often occasions the loss of a day's work, besides having their "draw" to pay. This circumstance alone determines the choice of the Davy lamp, and partially explains the reason why men are so often found, contrary to the rules of the pit, in possession of a false key to open the lamp to relight it, and not to enable them to enjoy the luxury of a pipe.

The Dumas lamp consists of a battery, an induction coil, and a vacuum tube, and utilises the light produced by the passage of an electric current through a glass tube. It produces a slightly magnified glowworm light, just sufficient to guide the miner through the darkness, but barely enough to see to work by. The tube is made of uranium glass hermetically sealed in vacuo, which is protected by a thicker exterior tube, to which is attached a semi-cylindrical reflector to concentrate the light. If the light of such a lamp can in any way be utilised in mines, it may prove of value, for it could not be extinguished either by gas or by a sudden irruption of water, as it shows equally well under water. The batteries may also be made of use for other purposes, such as exploding gun-cotton or gunpowder for blasting, &c. I believe, however, that practical men, and those who

have tried the lamp, despair of bringing it into general use. A very serious drawback to its general employment is its expensive and cumbrous form, and after all, the light it gives out is very inferior to either the Davy or Stephenson lamp. Danger is, however, reduced to a minimum, because, in the event of fracture of the glass tube, the vacuum is destroyed, the air rushes in, and the lamp is immediately extinguished.

We may then conclude that all mere mechanical contrivances for shutting off the gas from the source of illumination have proved failures, and altogether inadequate to grapple with the difficulties to be dealt with in mines; and therefore science has been driven to look in another direction for the means of lessening the dangers attendant upon mining. For this purpose Mr. G. F. Ansell, of the Royal Mint, lately invented a most sensitive "Fire-damp indicator," whereby he is able to detect the smallest appreciable quantity of fire-damp in a mine. This is undoubtedly a step in the right direction.

As in the case of the safety lamp, Ansell's fire-damp indicator is the practical application of a natural law, that of diffusion. Dr. Priestley first noticed the phenomenon which has since been more fully developed by Berthollet and Dobereiner in 1825, and by Graham still more recently, who evidently sought out and explained the law which governs the diffusion of gases, and which law may be thus popularly explained:—When two different gases, as atmospheric air and fire-damp, for example, are brought into contact with each other, they have a tendency to mix; and while this mixing is taking place, the atoms of each gas travel at a certain speed peculiar to that gas, which speed remains the same under all circumstances. Another peculiarity is, that the speed of a gas remains the same whether it is passing into space or intermixing with another gas, and whether it passes through a porous substance or an open tube. Mr. Ansell practically applies these facts to the detection of fire-damp; and since his indicator enables him to ascertain the exact percentage of this or other deleterious gases, the application is of the very highest importance and value, not only for coal and metal mines, but wherever subterranean works of any kind have to be carried on, for it as readily indicates the presence of the deadly choke-damp if in a poisonous amount. It is also capable of being made equally useful for the detection of coal-gas in houses and large buildings, as theatres, railway tunnels, and the proposed subways in our streets; or in the holds of ships, where foul air or fire-damp often collects. In short, in various other branches of mechanical art, it is capable of being turned to most valuable account for the preservation of human life.

Many of the phenomena attendant upon the mixture of gases are so extremely interesting, that we must not pass them by without a few special observations; and for the better elucidation of our subject it will be as well that we should briefly notice some of the more important. The laws which govern the movements of mixed gases are of a totally different character to those which operate upon mixed fluids. The latter are invariably arranged in strata, or layers as it were, and in exact accordance with their specific gravities, the lightest finding its way to the surface, and the heaviest sinking to the bottom of the vessel in which they are placed. From this fact it is concluded that no chemical action is exerted in order to effect their incorporation, and that by the force of gravity alone each liquid assumes its relative position. With respect to gases, which also vary in density to a very considerable extent, no such separation takes place. If chlorine and hydrogen, the specific gravity of the former being thirty-six times as great as that of the latter, be placed in two distinct vessels, and be allowed to communicate by means of a long tube, the hydrogen, or the lighter gas, being placed uppermost, the heavier chlorine will, in the course of a few hours, find its way into the upper jar, as may be seen by its green colour, whilst the hydrogen will pass downwards into the lower jar, and ultimately the two gases will be found to be equally intermixed throughout, and when once mixed, there is no disposition to separate again, however long they may remain at rest together. The rapidity with which this diffusion occurs varies with the specific gravity of the gases; and, contrary to what might be generally supposed, the more widely the two gases differ in density, the more rapid is the process of intermixture. In the earliest investigations into this very interesting subject, a very simple apparatus was employed, which consisted of a plain cylindrical glass tube, ten or twelve inches in length, and one inch in diameter, closed at one end by a porous plate of plaster of Paris, graphite, or any dry porus substance; it is then ready for use. The term *diffusiometer* has since been applied to it.

Mr. Ansell has a ready and simple mode of showing the action of the diffusiometer. He takes the tube and fills it with ordinary coal-gas; this he supports in a jar of water, when the water immediately begins to rise in the tube, and will continue to do so in opposition to gravity, until in the course of a few minutes it stands three or four inches higher inside the tube than the surface of the fluid in the outer vessel, in consequence of the coal-gas passing out through the pores of the plaster of Paris much more rapidly than the air can pass in. In the case where different gases are mixed, and then introduced into the diffusion tube, each preserves the rate of diffusion peculiar to itself. If, for instance, hydrogen and carbonic acid be mixed and placed in the diffusion tube, the hydrogen passes out with much greater rapidity than the carbonic acid, and a partial mechanical separation of two gases differing in density may thus be effected. The rate of diffusion is, as might be expected, accelerated by a rise of temperature; for by heat all gases are rendered specifically lighter.

The rapid passage of gas through the minute pores of the plates is a remarkable phenomenon, and one which is thought to fully demonstrate the molecular theory of bodies; but still more remarkable, the infinitesimal particles of gaseous bodies find their way quite as readily through such substances as india-rubber, etc., which neither microscopical nor chemical examination has heretofore shown to be porous. Upon submitting the very finest pellicle of india-rubber to the highest power of the microscope, it presents a perfectly homogeneous appearance, and no pressure, however carefully applied, will force a fluid through its minute pores; nevertheless gases pass readily through it. And if there is one point in connection with this discovery of Mr. Ansell's possessing greater interest for chemists than another, it is that heavy carbonic acid as readily diffuses through this substance as the lighter gases; and in an equal degree produces expansion of the india-rubber. He is engaged in the investigation of this very remarkable fact, with a view to discover the law on which it is based.

The process of diffusion is one which is continually going on and playing an important part in the atmosphere which surrounds us, as well as in the various departments of nature. Accumulations of gases unfit for the support of animal and vegetable life, are by this means silently and speedily dispersed; even respiration itself could not be long maintained were it not for the process of diffusion, which rapidly displaces the air that has been rendered unfit for the support of life, and at the same time draws downwards a fresh supply of pure and specifically lighter air.

Enough has now been said to convey a clear idea of the singularly beautiful phenomenon of the diffusion of gases, and light the way to a more exact comprehension of Mr. Ansell's fire-damp and choke-damp indicator.

It was represented to this gentleman that fire-damp would become comparatively harmless if its presence in the mine could be made known by a signal in the manager's room above ground; the essential feature being, that such means should be entirely self-acting. In September, 1862, Mr. Ansell visited some collieries

n the Midland district, for the purpose of ascertaining he conditions to be met, and was conducted to a portion f a pit known to be pretty tolerably charged with an xplosive mixture. The gas caused a peculiarly helpless eling to come over him, and "his head had an extra-rdinary light feeling, and it appeared to be filled with re-damp," so much so, that it occurred to him that if is head had been made of india-rubber, he could have rought away some of the gas. On his return home, an idia-rubber balloon his child was playing with attracted is attention, and he thought he might turn this play-ing to account; this thought was elaborated, and asso-ated with a law just spoken of, and then uppermost in is mind—namely, that of osmose, or diffusion.

Mr. Ansell's first experiments with this india-rubber alloon were so near perfection, that all subsequent im-rovements in the form of the apparatus partake more f the nature of scientific refinements than of any positive eparture from his original conception.

It will only be necessary to mention here that Mr. nsell applies the principle of the diffusion of gases to roduce sufficient force to release a detent, and set an arum in action. An inflated india-rubber ball, prevented om expanding laterally, or a bent tube of mercury, en-rged at one end, and closed with a porous cover, is all e apparatus that is needed for the purpose. If the ball tube be exposed to any kind of gas, that gas will pass rough the porous structure; and mixing with the air nfined in the ball, or under the porous cover, will in-ease its bulk. Thus the ball will receive a vertical ex-nsion, and may be used to set the detent of an alarum paratus in action; or mercury, being forced up the en limb of a bent tube, may be used as an indicator, an electrical conductor, to convey a telegraphic signal the mouth of a pit, or the manager's office, or any her convenient place.

Mr. Short, of the firm of Marratt and Short, of King illiam-street, has, under Mr. Ansell's direction, suc-eded in producing a convenient and cheap adaptation this beautiful invention, which consists of a tube with porous tile, an alarm bell, and a small permanent lvanic battery, inclosed in a case. The action of this tle instrument is so rapid, that the alarm is given in s than five seconds from the time of an irruption of s. The apparatus also possesses the advantage of rtability; the miner is enabled to move it with im to any part of the workings. The instrument above oken of is intended to give warning alone; but if it desired for the information of viewers, inspectors, ners, and others, to ascertain the amount per cent. of ther fire-damp or choke-damp present in the air of ines, Mr. Ansell varies the form of his apparatus, the ost convenient for the purpose being that of a small eroid barometer for the waistcoat pocket.

The dial-plate of the aneroid is graduated with the ordi-ry barometrical scale, which gives it the advantage of ing used as a barometer when not wanted as an "indica-r;" a small valve is the only addition necessary, and this hen opened converts the instrument into a barometer, d when closed into a fire-damp indicator. Its indica-ons are uniform and unvarying, giving for 100 per nt. of gas 1·68 inches rise on the barometrical ale, and for 10 per cent. 0·130 inch. The presence of oke-damp is readily determined by this instrument, as e index-hand moves in an opposite direction when unged into a mixture containing the smallest per-ntage of carbonic acid.

The action of the instrument, from its simplicity of nstruction, is readily understood. When placed in atmosphere containing fire-damp, the hand travels er the face of the dial because the diffusion of the re-damp into the chamber of the aneroid barometer uses an increased volume, which, being forced to cupy a fixed space, makes pressure on the partly ex-usted chamber within that space, and thus causes the nd to move over the face of the dial, indicating un-illingly the amount per cent. of explosive gas. The following results have been obtained in the presence of experienced miners by Ansell's aneroid indicator:—

The aneroid indicated 1·5 per cent. of fire-damp. The Davy lamp gave no indication.

The aneroid indicated 3·0 per cent. of fire-damp. The gas could be detected by the Davy lamp, which gave a small blue flame.

The aneroid indicated 6·0 per cent. The Davy lamp did not explode, but its flame elongated greatly.

The aneroid indicated 8·0 per cent. The Davy lamp exploded feebly.

The aneroid indicated 10·0 per cent. The Davy lamp exploded fiercely.

Very lately Mr. Ansell attended in one of the com-mittee-rooms of the House of Lords for the purpose of exhibiting his invention, and so satisfied of its value were all who witnessed the experiments, that Sir George Grey thought fit to direct an inquiry into its merits. Indeed, it is impossible for anyone to see this refined scientific application and not be struck with its practicability and utility for the purpose of indicating the presence of fire-damp in mines before it becomes dangerous from accumulation. Mr. Robert Hunt speaks in the highest terms of the value of this beautiful instrument. He is, I believe, perfectly satisfied of its utility, and I trust is here to night to speak of its merits and demerits, if he thinks it has any. But so confident do I feel of its practicability and usefulness that I am sure, if mine-owners will but give it a fair trial for twelve months, they will have the satis-faction of seeing "accidents from explosions" almost, if not entirely, abolished from the annual reports.

DISCUSSION.

Mr. Robert Hunt, F.R.S., said he could not but ex-press his gratification at the able manner in which Mr. Hogg had brought forward this subject. When it was remembered that at the present time we were raising little short of one hundred million tons of coals annu-ally, involving the sacrifice of a thousand lives every year, it was a matter which came home to the heart of every one, and consequently every invention which might tend to lessen, even in a small degree, this fearful destruction of life, merited our serious attention. With regard to Mr. Ansell's invention, he could not but say he regarded it as one of the most beautiful applications of science that he had ever seen, and one which appeared likely to be most useful. They must not, however, while they admired this beautiful instrument, expect too much from it at once. They had to contend with the preju-dices and existing habits of uneducated men. He had, within the last few weeks, visited all the great colliery centres of the United Kingdom, in each of which he had conversed with the colliery inspectors and viewers, on the advantages and disadvantages of Mr. Ansell's invention. A great many spoke highly in its praise, whilst others stated some objections to it. Some of them told him that with the safety lamp they could detect fire-damp as readily and accurately as with Mr. Ansell's aneroid instrument. It was certainly the fact that a practised eye could determine, with a great amount of accuracy, by the condition of the flame in the safety-lamp, the quantity of fire-damp that was present; but there was often carelessness, induced by habit and want of education, that led the men to disre-gard these indications; and when they found that the lengthened flame of the lamp only showed a small amount of fire-damp, they were satisfied it was not sufficient to occasion an explosion, and took no precautions. It was found that constant association with danger, after a time, produced recklessness, and the same thing might occur even if Mr. Ansell's instrument was in use. He remem-bered the first time he saw fire-damp was under circum-stances which rather terrified him. He was in a mine in which naked candles were employed, and, having expressed a wish to see a part of the mine in which fire-

damp was known to exist, he was conducted to one of the galleries in the roof of which he was told there was fire-damp. In proof of that, his companion gradually raised his candle towards the roof, the flame becoming elongated as he did so, and the man informed him that if it were raised six inches higher there would be an explosion. It would be satisfactory to state that a few weeks since he attended at a trade meeting of coal owners in the town of Leeds, and having one of Mr. Ansell's instruments with him he explained it to several coal proprietors, one and all of whom expressed a desire to possess it, so satisfied were they of its usefulness and applicability. Some of them told him they were satisfied that every colliery viewer and manager would soon carry one of these instruments as he now carried his watch. He did not at present think they could expect any very general practical application of the other form of indicator which Mr. Ansell had introduced, except in some of the most fiery districts, as it involved a somewhat complicated system of electrical communication throughout the mine. He could have wished that Mr. Hogg, in the paper he had brought before them, had not mixed up the metalliferous mines and the coal mines. The circumstances of the two were so entirely different, that it was a pity they should be in any way confused together. The employment of the collier was healthy in the extreme; a more healthy class of men was not to be found among the working population of the United Kingdom. On the other hand, a more unhealthy set of men than the metalliferous miners could not be found. The miners of Cornwall were mentioned as especial examples of the injurious effects of working in bad air. The mines of Cumberland, Durham, Northumberland, North Wales, and Cardiganshire, were as injurious as the deeper mines of Cornwall, and yielded more carbonic acid. With regard to collieries, the ventilation was generally as satisfactory as could be expected, looking at the difficulties with which the subject was surrounded. The quantity of air constantly passing through the mines was generally sufficient to sweep out the fire-damp, but still they were and ever must be liable to sudden outbursts of fire-damp, and these might be detected by the miner by the aid of Mr. Ansell's instrument. The ventilation of metalliferous mines in nearly all cases was that which was called "natural." The ventilation in the Cornish mines had been spoken of by the commissioners appointed to examine into the question as of the worst description, and the analyses of Dr. Angus Smith and others had shown that the air was not in a satisfactory condition. It must, however, be remembered that the main parts of a metalliferous mine were not in this deadly state; but where the men were driving levels or working at the close ends there were accumulations of organic matters and of carbonic acid gas which were exceedingly injurious. The application of the plans adopted in the collieries to metalliferous mines had been spoken of, but he was not himself prepared to believe that the one condition of ventilation was applicable to the other, as the conditions of the two descriptions of mines were totally different. In ventilating collieries they were dealing with a series of galleries worked upon a horizontal plane, whilst in a metalliferous mine the galleries were worked vertically, and thus the means of ventilation which were applicable to the one condition were not applicable to the other. Doubts had been thrown out in the paper as to the value of the safety-lamp, but his own belief was that a well-constructed safety-lamp was as perfect an instrument as could be made by human hands; and if the modified Davy lamp were placed in the hands of the men he did not believe it was possible to supply colliery miners with a safer instrument. That the men were reckless there was no question. He had himself seen them suck the flame through the wire gauze to light their pipes, and with the point of the pick endeavour to open the wire so as to obtain a better light to read by. They had for the most part to deal with an ignorant, uneducated class of men; and while they were producing for them a series of ingenious mechanical appliances—while they were studying a series of delicate scientific applications—they were forgetting one essential—the education of those men. It was no more use giving an ignorant man such an instrument as this than giving a watch to a baby. The education of these men would be a work of time, but the time would be well spent in giving them the right kind of education, which would ultimately teach them the best means of protecting themselves.

Mr. P. H. Holland agreed with much that had been said by Mr. Hunt, but he must take exception to the remarks made with respect to the Commission, of which he (Mr. Holland) was a member. Mr. Hunt implied that the commissioners came to the conclusion that metal mines and coal mines could be ventilated in the same way. He could say for himself, and he believed for every other member of that commission, that no such absurd idea was ever entertained by them. They only insisted that a sufficient quantity of air should be supplied to each description of mine. The means by which it was supplied would be as different as the two cases were different, the one being worked on a vertical plane, and the other on a horizontal plane. Another point to which he took exception was attributing a large portion of the diseases among metal miners to the effects of carbonic acid gas. He believed the evil effects of that gas to be overrated; it was only to a small extent that miners were injuriously affected by it. It was not so much the bad air of the mine itself as the confinement of gunpowder smoke, animal effluvia, candle fumes, and dust, which should be carried away by ventilation. Another way in which metal miners suffered was, that, often working below in great heat, a sudden chill was occasioned when they came into the upper atmosphere. The catching cold after working in the hot, close mine, with the frame exhausted by foul air, was one of the great causes of the diseases from which the miner suffered. The author of the paper had made a slight error in representing him (Mr. Holland) as having been employed to investigate the cause of the Lundhill explosion, but his commission was only to effect the removal of the bodies with the least danger to those employed. In the next place Mr. Hogg entertained the impression that the great attention which had been paid to this subject had produced very little fruit, but he (Mr. Holland) was of a contrary opinion. The new legislation had done much good. There was a difference of opinion as to the extent to which the number of miners had increased in the country, but they knew it was very considerable. The number of deaths from accidents from all causes, which used to be 1,000 per annum, was now only 957. That appeared to be a small diminution; but when it was recollected how large an increase had taken place in the number of miners (which some estimated at 30 per cent.), it reduced the relative amount of accidents very much indeed. This was due, in his opinion, partly to the fact that the new legislation threw the responsibility more definitely upon the owners of the mines of guarding against accidents. Thus the number of deaths from explosions had been diminished from 114 per 100,000 to 50; those from shaft accidents, from 100 to 54; those from falls of coal or roof, from 176 to 148; and those from miscellaneous accidents, from 78 to 71. He did not in this statement include the Hartley colliery accident, which resulted in 204 deaths; by this the miscellaneous deaths would be largely increased; but the occurrence was so exceptional in itself that it would not be fair to take it into account in taking an average of a small number of years. The two large classes of accidents against which the owners had to take precautions had diminished to about half, whereas the others had not diminished so much. That was a strong indication that the principle he advocated in 1859, that the masters should be made responsible for the precautions to be observed, was a

rue principle. But that was not all. These accidents rere, however, still a great deal too frequent. He did tot hope to prevent explosions in mines altogether; that vould be Utopian, but the number of deaths might be till further diminished. The great cause of explosions ras the sudden accumulation of gas; and such an accuaulation as would involve a loss of life could hardly take lace in a short time; if, therefore, they could have inications of the state of the mine at frequent short intertals, they might have comparative security against arge explosions. What better plan could be adopted hen putting the mine itself in communication with the ffice of the manager? This was done by Mr. Ansell's astrument. He confessed himself a convert to this inention. His impression at first was that it was a very eautiful invention, but one of very little practical use, ecause the safety-lamp would indicate the state of the ine; but there was this difference, the safety-lamp only dicated this at the spot itself, whilst this instrument dicated it at the manager's office, and this would act a material check upon the men. One of the most ommon causes of accidents was the neglect of ordinary recaution in the opening or closing of a door within ie mine. This would arise much less frequently if the aster had the means of instantly detecting such a eglect of duty. Having spoken in high terms of Mr. nsell's instruments, Mr. Holland urged that proper ials of them should be made in all our mines; and he ould not imagine that practical men would offer any bjections to them. They had no right to expose their en to danger in respect of explosions through obstinate jection of proper precautions. If this invention was ally, as he believed, of the greatest value, colliery mers should not be merely asked to adopt it, but ould be compelled to do so.

Mr. J. A. Phillips observed that the last speaker id implied that practical men were prejudiced, and unilling to adopt scientific improvements, but it must be membered that practical men were fully aware that, merally speaking, scientific men were eminently unactical, and, consequently, it was not to be wondered if they (the practical men) sometimes hesitated in lopting the suggestions of men of science. With rerd to Mr. Ansell's instruments, as indicating imperfect ntilation, it must be remembered that although each dividual instrument would doubtless give the alarm in se of an accumulation of gas in the locality in which was situated, yet the state of ventilation would differ essentially in the different portions of a mine, as to ecssitate the introduction of a great number of instruents along the different galleries and workings. To ich of these separate wires would have to be attached, mmunicating with different instruments in the manar's office, necessarily entailing much expense and comlication. He therefore doubted if the proposed system ould be found so easy of practical application as the ntleman who had last spoken appeared to anticipate.

Mr. Hunt begged to be allowed to say that Mr. olland left an impression on the minds of those who d listened to him that the proprietors of collieries were ot sufficiently careful either of their men or their prorty. He inferred that they required to be compelled to this thing and that thing, as though they were not emselves anxious to protect the lives of their men. He lt bound to say that his experience led him to the conusion that throughout the United Kingdom there was o class of employers who were more desirous of procting their men than were the colliery proprietors, and we would only suggest to them—not insist upon it— e introduction of an appliance for the benefit of their en and the security of their property, he believed they ould at once adopt it.

Mr. Holland remarked that since the ventilation of e mines and the covering of the cages had been insted upon by the Legislature the accidents of a certain ass had diminished by one-half.

Mr. Varley said, fifty years ago, in this room, a very long discussion took place amongst those interested in coal mines as to the means of ventilation. He thought the plan then advocated, which he called the air syphon system, produced the most complete and effective ventilation.

Mr. R. H. C. Wilson inquired whether Mr. Ansell's aneroid indicator was graduated to a uniform standard, so that any number of instruments would give precisely similar indications.

Mr. Ansell replied that this was the case.

Mr. Benjamin Shaw, referring to the invention of a safety cage for miners to prevent accidents from the breaking of the rope or chain in descending the shaft, inquired whether any sufficient reason was known for its not being generally employed. Having lately visited the Clay Cross collieries, he could bear testimony to the measures which were taken by that company for providing for the educational and social wants of the large community of people employed in those collieries; especial attention was there paid to the education of the children of the colliers.

The Chairman said he was sure all present would agree that Mr. Hogg deserved their best thanks for the interesting and able paper he had read that evening. He thought if the instrument invented by Mr. Ansell were brought into practical use, its value would soon be appreciated. If the public felt some degree of certainty that the fearful accidents which were now so frequently occurring might be greatly mitigated or wholly prevented by an instrument like this, they would feel that those who were held responsible for those accidents, and who neglected to provide themselves with so simple an apparatus, were highly culpable. He thought the most practical way of bringing an invention of this kind into general use, was to make either the owner or the agent responsible for any accidents that its use might have prevented. No matter what Acts of Parliament were passed, or what rules were laid down, they would be all treated as nothing until public opinion was brought to bear upon mine owners, to compel them to adopt this or any other useful invention for saving life in mines. He thought they owed much to Mr. Hogg for having brought this subject so lucidly before them, and for introducing to their notice Mr. Ansell's valuable instrument.

The vote of thanks having been passed,

Mr. Hogg expressed his acknowledgments for the manner in which his paper had been received. He was aware that a great variety of topics were embraced in it, and for that reason he was unable to go so fully into the merits of Mr. Ansell's invention as he could have desired. The aneroid indicators were manufactured to a uniform scale, and gave uniform indications. With regard to his having mixed up the subjects of coal and metal mines, this had been forced upon him by the form in which the reports of the inspectors of mines were drawn up, in which he found these subjects so combined that he was unable to separate them. That the education of the mining population, and more especially of their children, was receiving a greater amount of attention there could be no question; and children under twelve years of age were not allowed to be employed in mines; but in spite of all the efforts made, he agreed with Mr. Holland that there had not been so much done as ought to be done. He did not place much stress upon the diminution of the ratio of deaths as that gentleman did, regard being had to the increased number employed, because he found that the decrease of accidents was principally confined to the northern coal mines, and did not affect the metal mines of the south. Looking to the reports of the inspectors, he believed the safety cage alluded to by Mr. Shaw had been very much adopted. As to the necessity for a great multiplicity of Mr. Ansell's indicators, which had been objected to by Mr. Phillips, he apprehended that one instrument would be sufficient for the protection of each working, and the wires being placed in connection with the signalling apparatus,

would convey the warning to the manager's office above ground. He thought that no confusion need be apprehended in such an arrangement.

Mr. G. F. Ansell has forwarded the following description of the different forms of his apparatus referred to by Mr. Hogg:—The apparatus is of three kinds. The first consists of a diffusiometer, an electric alarum, and a small galvanic battery, the whole being arranged under a small stand, of sufficient portability for the miner to carry with him into the heading where he is at work, and upon a sudden irruption of fire-damp the alarum is rung instantaneously. Its action may be explained in the following manner:—The diffusiometer consists of a bent tube in the form of the letter U, having at one end a cup or chamber, the surface of which is enclosed by a piece of porous tile. This tube is partially filled with mercury. When the fire-damp surrounds it, diffusion of the gas takes place through the porous tile, compressing the volume of air within the cup, and thereby forcing the mercury downwards, which rises in a corresponding manner in the opposite side of the tube; this is made to form contact with one of the terminal poles of the battery, and the alarm is given. By proper adjustment it can be set to indicate within five seconds after the irruption of gas. The second form of instrument is for indicating gradual accumulation; it consists of an inflated india-rubber ball, which is fixed in a frame. Diffusion takes place through the surface of the ball, causing it to expand. This force is applied by a mechanical arrangement to complete the circuit of a battery, and by means of a telegraphic wire it will indicate at the mouth of the pit where the air of that particular part of the mine is explosive. These instruments could be placed in different parts of the mine, and by a simple system of telegraphy a perfect knowledge of the state of the air would be had by those above ground; and in the case of a gradual accumulation taking place in the night during the absence of the miners, the affected part of the mine would be indicated at the mouth of the pit. The third arrangement is for indicating the presence of fire-damp and measuring its quantity. It is an adaptation of the aneroid barometer, and is extremely portable, being little larger than an ordinary watch. The instrument is graduated to the ordinary barometrical scale, and can be used as a barometer. When not required as a fire-damp indicator a small valve is attached, which, being open, admits the atmosphere, and the instrument acts as a barometer; but when closed, the admission of gas must be through a porous tile, which causes compression (as before explained), and the indication is given by the hand upon the dial. The indications are unvarying, 100 per cent. of fire-damp being indicated by 1·680 inches of the barometrical scale, and 10 per cent. by 0·130 inches. It will also determine the amount of carbonic acid or choke-damp, the hand moving in the opposite direction to that for fire-damp.

Mr. R. H. C. Wilson writes:—"I found, on examining Mr. Ansell's aneroid indicator after the meeting, that it is really a pocket aneroid, the only difference in construction being that the back of the outside metal case is cut out, and a back of plaster of Paris is put in its place. It is really wonderful that so slight an alteration should cause the instrument to act independently of atmospheric pressure. It appears that a variation in the aneroid of one-tenth shows danger; the range of the instrument, therefore, between safety and danger, is very small indeed, and it would be very desirable if it could be made much opener in the scale."

Proceedings of Institutions.

South-Eastern Railway Mechanics' Institution.—The report for the half-year ending 31st March last (being the thirty-seventh), congratulates the members on the highly satisfactory position of the Institution at the present time. There are now 280 members of the Institution, which is an increase of 45 over the corresponding period of last year. Eighteen volumes have been purchased for the library during the half-year. The library now contains 1,430 volumes, and two-thirds of them have been in circulation during the half-year. The only alteration in the supply of papers to the reading-room has been the addition of the *English Mechanic*, which is published once a week. In consequence of the great number of female members of the Institution, it was considered desirable that they should have a room appropriated to their own exclusive use on the evenings of Tuesday and Saturday, when the books are changed; the Council-room has therefore been placed at their disposal on those evenings, and been supplied with suitable papers and periodicals. This plan seems to be appreciated by the females, as they frequently attend in large numbers. It is in contemplation to form a class next winter, to consist of female members only, for instruction in domestic economy, with the view of preparing them for examination in that subject by the Society of Arts examiners. Classes for instruction in arithmetic, writing, and spelling, French, and vocal music have been carried on very successfully during the whole of the past six months. Upwards of eighty members have been attending these classes. The members have been privileged to attend gratuitously nine lectures in connection with the Ashford Institution; the attendance was remarkably good, the average per lecture being nearly a hundred. The financial statement for the half-year shows that the balance from last half-year was £84 9s. 9d., which was raised, by the receipts of the present half-year, to £130 12s. 5d. There is now a balance in hand of £47 12s. 6d.

FRENCH REPORT ON TRICHINIASIS.

Two members of the French Academy of Medicine, M. Delpech, Professor of Medicine, and M. Reynal, of the Veterinary College of Alfort, have recently returned from Germany, where they investigated this subject, and have made their report to the French Minister of Agriculture. They declare that the disease is everywhere either extinct or dying out; and, moreover, that, with the single exception of the epidemic at Hedersleben, where a concourse of unfortunate circumstances led to the most terrible results, the mortality has been everywhere insignificant. At Zwickau, Seitendorf, and Sommerfel, out of 80 to 86 cases not a single death appears to have occurred.

Amongst other statements in the report are the following:—The existence of trichinæ is exceedingly common in Germany; nothing in the appearance of the living animal nor in its flesh when killed is to be detected either by the naked eye or by means of an ordinary magnifying glass; the microscope alone brings the insects or their eggs into view. No case of trichiniasis either in man or amongst pigs, is known to have originated in France; wherever this disease exists, the rats, in the horse-slaughterers' yards and in the abattoirs, are found to be infested with trichinæ; examination of these creatures in Paris has not brought to light any trace of these parasites. The writers of the report protest against the terror which trichiniasis has created, and declare that so long as pork is only eaten after being well cooked there is no real danger; moreover, that no trichinæ are even found in the heart, liver, kidneys, brains, or fat of the pig, so that there should not be the slightest apprehension as regards those parts. The report adopts the view entertained in Germany that a temperature of about 136° Fahrenheit is sufficient to destroy the trichinæ. Thorough salting and hot fumigation, continued during twenty-four hours, they believe to be equally effectual, but cold smoking has no effect. MM. Delpech and Reynal attribute the existence of trichinæ

pigs to the eating of the flesh of rats, hedgehogs, and other small animals and filth; and propose as remedies the keeping of the pigs in clean well-aired pens or sheds, and the careful preparation of their food when any fear of trichinæ exists; but they express no opinion as to the origin of the trichinæ themselves.

Commerce.

COFFEE.—Lascelles, in his work "On the Nature and Cultivation of Coffee," says, the total quantity of coffee consumed in Great Britain in 1864 was about 35,000,000 lbs., of which nearly 30,000,000 lbs. were the produce of India and Ceylon. The total imports to Europe now amount to about 290,000,000 lbs. France alone consumes one-sixth of the total production of the world. In 18[illegible] the exports from Jamaica alone exceeded [illegible] lbs., while at present they do not reach [illegible] lbs. In British Guiana the exports have fallen from 2,472,000 lbs. to nothing, scarcely sufficient being grown for consumption in the colony; even in [illegible] the exports have decreased, 2,060,819 bags being shipped in 1859, and only 1,495,697 bags in 1864.

Colonies.

VINE GROWING IN NEW-SOUTH WALES.—The River Murray District appears to be becoming an important vine-growing district, and the large yield of wine has always found a ready sale in Victoria. Several hundreds of acres have been planted by industrial cultivators, and the fruit this season is reported to be small and scarce, with less than the ordinary quantity of saccharine matter, whilst along the coast-line the crop has been luxuriant.

VINE CROP IN SOUTH AUSTRALIA.—The probable average yield per acre of full bearing vines was estimated at 400 gallons, and there appeared every reason to anticipate that the quality would be such as to give a name to the vintage of 1866, and to elevate the character of the wine in the market.

THE FORTHCOMING INTERNATIONAL EXHIBITION AT [illegible] is being prepared for by the committee appointed to collect suitable examples of the produce of the colony, and there is every reason to believe that in cultivated as well as natural sources of wealth the Perth district will make a considerable show. The minerals, timber, wines, oil, dried fruits and other productions will be exhibited, but in articles of general agriculture the season has been too unpropitious to admit of their sending such samples of wheat, &c., as were exhibited at the London Exhibition of 1862.

FIRE AT PERTH.—A very serious destruction of property has lately been caused by a fire in Perth (Australia), and the fact that much of it might have been saved had there existed any organized means of prevention, has directed attention to the necessity of a volunteer fire brigade, and a meeting has been held to endeavour to secure a good engine and a proper equipment for the [illegible]. Pecuniary assistance will probably be given by Government.

Publications Issued.

ANNUAIRE SCIENTIFIQUE POUR 1866. By M. Dehérain. [illegible].—One of the best of the many annuals devoted to the records of scientific progress. M. Dehérain is Professor of Chemistry in the Central School of Architecture and at the Collège Chaptal, and his assistants in the compilation of the annuaire are, M. Amédée Guillemin, Tré-[illegible] Worms, Reitop, Duméril, Vignes, Margollé, Zurcher, [illegible] Menu de St. Mesmin.

A DEFENCE OF THE PRESENT PATENT-LAW. By Michael Henry, Esq. (Published by the Author, 68, Fleet-street.)—This pamphlet sets forth at length the various arguments in favour of the existing patent-law, and concludes by warning persons interested in the industrial and material prosperity of our country against "rashly tampering with a system under which the manufactures and commerce of England have attained a proud position. Let them pause (says the writer) before, by interference with rights of property in invention, they offer grounds of interference with all intellectual and intangible property—the copyright of the designer, artist, publisher, and author—copyright in work, writings, names, and trade marks."

Correspondence.

DR. THUDICHUM'S PAPER.—SIR,—No paper which has been read before the Society can be of more real importance to the public (though repulsive to read) than that with which Dr. Thudichum favoured the members on the 18th inst. The readers of the *Journal* will recollect that in 1857, 1858, an epidemic appeared among the swine in various portions of the American States, which swept them away by thousands. The rapidity with which the disease executed its fatal mission gave rise to the name of "hog cholera." In the Ohio State Agricultural Reports, in my possession, vol. for 1858, the distinguished and learned secretary, Klippart, furnishes a most able paper, by Dr. Wienland, of Cambridge, state of Massachusetts, which may fairly be placed by the side of Dr. Thudichum's, as it most fully substantiates by facts all that that gentleman asserted. In the article referred to, on the "Nature and Organisation of Tape-worms generally," Dr. Wienland proves that measles in the hog (*Cysticercus cellulosæ*) and tape-worm in man (*Taenia solium*) are identical; he arrives at the conclusion in a very scientific and legitimate manner, and it may be well for the agricultural public to be advised of the fact, as well as the steps by which it became known, and the remedies applied, which proved beneficial to the beast, and at length effected an entire cure. This was, to put tar in the bottom of the trough (say a pint in one twelve feet long), and a couple of ounces of flour of sulphur; then one ounce of dissolved saltpetre put with the food into the trough once a day, and chloride of lime sprinkled about the sleeping places. Dr. Wienland concludes that beef is very rarely measly, but it is so sometimes; and though tape-worm in the intestines is certainly troublesome, yet it never seems to be really dangerous, at any rate, to mankind; not so much so as its larva, which evades the skill of the physician when the patient is affected with the hydatids of *Taenia solium*.—I remain, &c., CHARLES F. DENNET.

Ladbroke-square, April 23, 1866.

MEETINGS FOR THE ENSUING WEEK.

MON......British Architects, 8.
Actuaries, 7. Mr. W. S. B. Woolhouse, "On the Construction of Tables of Mortality."
Medical, 8. General Clinical Discussion. Cases by the President, Dr. Leared, Dr. Tilbury Fox, and Mr. Walter J. Coulson.
Zoological, 1. Annual Meeting.
Philosophical Club, 6. Annual Meeting.
R. United Service Inst., 8½. Mr. John Elder, "Marine Steam Engines."

TUES ...Civil Engineers, 8. 1. Discussion upon Mr. Manning's Paper, "On the Flow of Water off the Ground." 2. Mr. G. R. Burnell, "On the Water Supply of Paris."
Pathological, 8.
Anthropological, 8.
Geologists' Assoc., 8.
Royal Inst., 2. Annual Meeting.

WED ...Society of Arts, 8. Mr. George Glover, "On National Standards for Gas Measurement and Gas Meters."
R. Society of Literature, 8½.
R. United Service Inst., 8½. Mr. William Stirling Lacon, "The Loss of Life at Sea. The Remedy."

THUR. ...Royal, 8½.
Antiquaries, 8½.

Linnæan, 8. 1. Mr. George Busk, "Remarks on the Cranial and Dental Characters of the existing species of Hyæna." 2. Mr. G. S. Brady, "Monograph of the recent British Ostracoda."
Chemical, 8. 1. Dr. Gladstone, "Pyrophosphodiamic Acid." 2. Mr. R. Warington, Jun., "Tricalcic Phosphate."
R. Society Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Huxley, F.R.S., "On the Methods and Results of Ethnology."
FRI ......Philological, 8.
Society of Arts, 8. Cantor Lecture. Dr. Crace Calvert, "On the Artificial Production of Aromatic Substances." (Lecture IV.)
Royal Inst., 8. Prof. Abel, F.R.S., "On Recent Progress in the History of proposed Substitutes for Gunpowder."
Archæological Inst., 4.
R. United Service Inst., 3. Dr. Mouat, "The British Soldier in India."
SAT ......Royal Inst., 3. Prof. Huxley, "On the Methods and Results of Ethnology."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 17th April, 1866.*

101. Bill—Elective Franchise.
4. (III.) Cattle Plague—Three Orders in Council.
5. (I.) Small-pox in Sheep—Three Orders in Council.
64. Sheriff Courts (Scotland)—Returns.
182. Army (Hong Kong)—Letter.

Delivered on 18th April, 1866.

104. Bills—Public Libraries Act Amendment (as amended).
105. ,, Convicts' Property.
107. ,, Local Government Supplemental.
15. (330 to 337) Railway and Canal, &c., Bills—Board of Trade Reports.
174. London (City) Traffic Regulation Bill—Special Report.
177. Habeas Corpus Suspension (Ireland) Act (Cork Gaol)—Return.
177. (I.) Habeas Corpus Suspension (Ireland) Act (Waterford Gaol)—Returns.
177. (II.) Habeas Corpus Suspension (Ireland) Act (Waterford Gaol)—Correspondence.
178. Barony of Farney—Return.
184. Cattle Plague (Scotland)—Order in Council.
Ecclesiastical Commission—Eighteenth Report of Commissioners.

SESSION 1865.

475. Public Accounts—Return.

Delivered on 19th April, 1866.

108. Bills—Superannuations (Officers Metropolitan Vestries and District Boards) (amended).
109. ,, Railway Debentures, &c., Registry.
15. (338 and 339) Railway and Canal, &c., Bills—Board of Trade Reports.
133. Treasury Chest—Account.
180. Army (Limited Service)—Returns.
181. Army (Hong Kong and Kowloon)—Statement.
183. Ceylon—Complaint.
Cattle Plague (Ireland)—Report by Professor Ferguson.
Ordnance Survey and Topographical Depot—Report.

Patents.

From Commissioners of Patents' Journal, April 20th.

GRANTS OF PROVISIONAL PROTECTION.

Aerated waters—927—R. Hineson.
Boats, towing—50—O. de Mesnil.
Bobbin net or lace machinery—869—F. Robière.
Bones, treating—915—J. C. Martin.
Braiding and weaving machines—945—G. Davies.
Brewing, mashing grain used in—905—T. Ryder.
Brewers' refuse as a manure, application of—949—A. G. Lock.
Bridges—913—E. Kochs, T. Reuter, and O. Henriel.
Capsules, colouring—969—W. Betts.
Carpenter's plane—973—G. Muller.
Castors—3294—R. McL. Claypole.
Cheese—786—T. Manock.
Coke ovens—919—C. Pardoe.
Coke ovens—933—W. B. and E. J. Collis.
Concrete—975—T. W. Pearce.
Cork, cutting—963—M. Henry.
Cylindrical metallic rods and tubes, rolling, &c.—795—F. C. Bakewell.
Domestic polishing powder—856—G. P. Wheeler.
Drill and other braces—764—J. Varley.
Electro-magnetic power engines—931—W. Read.
Fabrics—782—T. Biggs, jun.
Fabrics—937—N. Legendre.
Fire-alarum—662—J. Crean and G. J. Barr.
Fire-alarum, self-acting—965—G. H. J. Simmons.
Fire-arms—760—E. Russ, and H. and E. Hammond.
Fire-arms, breech-loading—961—F. E. Walker.
Fire-escape—584—W. H. Prior.
Fire-escape—818—R. A. Jones and J. C. Hedges.
Glass—963—J. H. Johnson.
Grain, decorticating—917—H. E. Newton.
Guns, breech-loading—906—T. G. Sylven.
Jute and China grasses, treating—828—W. Clark.
Labels—961—R. Sweeting.
Leather cloth—907—T. Storey and W. V. Wilson.
Liquids, forcing—630—H. McPhail.
Lozenges, &c.—935—J. J. Derricy.
Machinery, controlling the speed of—882—T. Silver.
Manure, removal of—898—C. T. Liesaur.
Manures—773—A. G. Lock.
Meals, sifting—909—M. Myers.
Metal articles, making—740—P. H. Ashberry.
Metallic plates, annealing—646—G. Prentice and A. B. Inglis.
Minerals, cutting—433—W. F. Cooke and G. Hunter.
Noxious gases, deodorizing of—941—E. Brooke, jun.
Photographic portraiture—920—W. S. Laroche.
Pianofortes—977—B. Johnson.
Pipes used for smoking, cleaning—943—M. P. E. Vors.
Portable chairs—410—T. Clift.
Rotary brushing and rubbing apparatus—939—C. Turner.
Rotary steam engine—778—W. Goodwin.
Safes—911—R. Noake.
Shafts, lubricating the journals of—858—W. Whittaker and W. Lees.
Ships or vessels, bolts used in building—734—W. Simons.
Shirts—929—J. Blair.
Smokers, apparatus for—602—M. and M. Myers, and W. Hill.
Steam hammers—668—W. H. Berry.
Submarine and torpedo boat—766—S. S. Merriam.
Substances, bleaching—925—J. H. Johnson.
Surfaces, polishing—750—G. H. Smith.
Threads, spooling—3376—R. Smith.
Waste liquors, treating—812—T. Routledge, and T. and W. Richardson.
Wearing apparel—967—E. Pearson.
Weaving, looms for—903—R. M. Graystock.
Weaving, looms for—951—W. E. Newton.
Weaving, looms for—967—P. J. Macaigne.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Springs—1069—A. H. Brandon.
Tobacco, cutting—1036—G. Haseltine.

PATENTS SEALED.

2742. W. Snell.	2829. L. Pebeyre.
2743. F. H. Gray.	3208. C. K. Tomlinson and Hayward.
2753. G. A. Huddart.	3297. W. F. Cooke and G.
2767. G. W. Bacon.	58. H. N. Penrice.
2769. E. Heywood.	113. W. R. Lake.
2778. J. Combe.	146. C. N. Tyler.
2780. F. H. Gosange.	149. W. Lyne.
2781. S. Cotton.	168. G. Spencer.
2787. J. and J. Hinks.	186. G. T. Bousfield.
2828. B. F. Brunet.	

From Commissioners of Patents' Journal, April 24th.

PATENTS SEALED.

2765. W. Smith.	2833. J. Webster.
2766. L. Bennett.	2908. W. R. Lake.
2773. J. Garnett.	2996. A. V. Newton.
2774. J. Bernard.	3041. W. E. Newton.
2776. T. B. Jordan.	3042. W. R. Lake.
2784. W. and E. Westmoreland.	3043. W. R. Lake.
2793. E. Meldrum.	3044. W. R. Lake.
2794. R. Girdwood.	3052. H. E. Newton.
2797. G. E. Donisthorpe.	3099. T. Bell.
2798. D. P. G. Matthews.	3281. W. E. Newton.
2804. A. Deslandes.	3316. W. E. Newton.
2807. W. E. Newton.	34. F. Wright.
2808. H. Y. D. Scott.	460. H. B. Young.
2814. L. Pfeiffer.	509. H. Lea.
2822. W. E. Gedge.	
2824. M. Campbell, A. C. P. Coote, and J. C. A. H. Wolffram.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2459. J. R. Johnson and J. A. Harrison.	998. H. Donald.
2514. J. R. Johnson and J. S. Atkinson.	995. W. C. Cambridge.
966. J. Goucher.	1006. G. B. Barber.
972. C. W. and F. Siemens.	1072. G. E. Donisthorpe.
978. P. G. Rowell and H. Holt.	1104. J. Purdey.
1023. J. Thompson.	1223. W. Clark.
1024. J. Thompson.	1000. F. Durand.
985. A. Ford and R. Rigg.	1067. J. W. Proffitt and W. Duncan.
992. H., E., S., and J. Yeadon.	1013. P. McGregor.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

977. J. Freer.	1033. T. A. Weston.
1031. G. Ward.	1115. R. Mushet.
1020. T. S. Truss.	

Journal of the Society of Arts.

FRIDAY, MAY 4, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'Clock:—

MAY 9.—"On the Progress of Fire-arms for Military Purposes to their Present State." By Colonel E. C. WILFORD, late Assistant-Commandant and Chief Instructor at the Hythe School of Musketry.

MAY 16.—*Derby Day*—No Meeting.

CANTOR LECTURES.

The concluding lecture of the course "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," will be delivered this evening by Dr. F. CRACE CALVERT, F.R.S., as follows:—

LECTURE IV.—FRIDAY, MAY 4TH.

"ON THE ARTIFICIAL PRODUCTION OF AROMATIC SUBSTANCES."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadowsweet, coumarin*, and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor;* of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

The lecture commences at eight o'clock, and is open to members, each of whom has the privilege of introducing ONE friend.

The substance of these lectures will appear in the *Journal* during the autumn.

CENTRAL HALL OF ARTS AND SCIENCES.

The arrangements for erecting a Great Central Hall of Arts and Sciences at Kensington, on the ground purchased out of the profits of the Exhibition of 1851, having been carried so far as to secure the erection of that building, it has been thought desirable that members of the Society of Arts should be put in possession of full information on the subject, in case they should desire to invest in the property, before the whole of the available seats are disposed of. A copy of the prospectus was, therefore, forwarded to each member with the last number of the *Journal*, and the Secretary of the Society will afford any further information on the subject if applied to. A model of the Hall is now on view at the Society's house.

PRIZES FOR ART-WORKMEN.*

The Council of the Society of Arts hereby offer Prizes for Art-Workmanship, according to the following conditions:—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or, if sold previously to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed, the candidates must be prepared to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bona-fide* Art-workmen only can receive prizes.

VI. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

VIII. All the prizes are open to male and female competitors, and in addition, as regards painting on porcelain, decorative painting, and wall mosaics, a second set of prizes, of the same amounts, will be awarded among female competitors. If a female desire to compete in the female class only, she must declare her intention accordingly. The originals of the works prescribed may be seen at the South Kensington Museum, in the gallery at the entrance to the Sheepshanks pictures.

Casts may be seen at the Society of Arts, Adelphi, London, and the Schools of Art at Edinburgh, Dublin, Manchester, Glasgow, Birmingham, and Hanley in the Potteries.

Photographs, chromolithographs, engravings, rough casts in metal, &c., may be purchased at the Society of Arts, John-street, Adelphi, at the prices named.

The plaster casts of the examples in classes 2 and 4 may be obtained from Mr. Franchi, 15, Myddelton-street, Clerkenwell, E.C.; the other casts from Mr. D. Brucciani, 39, Russell-street, Covent-garden, W.C.

*** The Council are happy to announce that several of the works which received first prizes in the competitions of 1863, 1864, 1865, and 1866, have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

FIRST DIVISION.

WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.

For the successful rendering of the undermentioned designs in the various modes of workmanship according to the directions given in each case.

CLASS 1.—CARVING IN MARBLE, STONE, OR WOOD.

(*a*.) *The Human Figure*.—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work executed in marble or stone, after part of a frieze of a chimney-piece, by *Donatello*, No. 5,795, in the South

* The Worshipful Company of Salters contribute £10 annually to this Prize Fund. The North London Exhibition Prize consists of the interest of £167 7s. 3d. Consols, invested in the name of the Society of Arts, to be awarded by the Council "for the best specimen of Skilled Workmanship" at the Society's Exhibition of the works sent in for the Prizes named above.

Kensington Museum; or the "Boy and Dolphin, cast from a chimney-piece, ascribed to *Donatello*; original in the South Kensington Museum, No. 5,896. Dimensions—two-thirds the size of the cast (linear).—The design may be adhered to strictly or adapted to any architectural purpose.

[Cast—Fifteen Shillings; Photograph—One Shilling.]

(*b.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best work, executed in marble, stone, or wood after a carved chair-back in the South Kensington Museum. Dimensions—To be two-thirds of the cast (linear).

[Cast—Twelve Shillings. Photograph—One Shilling.]

(*c.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed in stone, after a *Gothic bracket* in the Architectural Museum. Dimensions the same as the cast. In this design the details may be improved by the introduction of small animals, and the human head may be changed according to the taste of the art-workman.

[Cast—Ten Shillings; Photograph—One Shilling.]

(*d.*)—One prize of £20 for the best, and a second prize of £10 for the next best, work carved in *wood* after a design by *Holbein*, as an *Inkstand* or *Watch-Holder* on three feet. Dimensions—Optional.

[Wood Engraving—Sixpence.]

(*e.*)—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work carved in wood after the *Head of a Harp* of the period of Louis XVI., in the South Kensington Museum, No. 8,531. The head and bust only need be fully completed. Dimensions—The same as the cast.

[Cast—Thirty Shillings; Photograph—One Shilling.]

(*f.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best, work carved in wood after an *Italian picture frame* in the possession of Henry Vaughan, Esq. Dimensions optional.—This design may be adhered to strictly or adapted in such manner as the workman may think fit.

[Photograph—Two Shillings.]

(*g.*) *Ornament carved and gilt.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed in wood, carved and gilt after a *Console Table* in the South Kensington Museum, No. 6947, of the period of Louis XVI. The work to be carved roughly in wood, then to be prepared in the white by a gilder, then cut up or carved in the white by the carver, then to be gilt in mat and burnished gold. As such work may probably be executed by two persons, the prize will be apportioned as the judges may determine.

[Photograph—One Shilling.]

CLASS 2.—REPOUSSÉ WORK IN ANY METAL.

(*a.*) *The Human Figure as a bas-relief.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after the Martelli Bronze Mirror Case, No. 8,717, in the South Kensington Museum—dimensions, $6\frac{1}{4}$ inches diameter. The whole or any sufficient part thereof the size of the original; or Raphael's "Three Graces."—Dimensions—The figures to be six inches high.

[Cast of Mirror Case—Two Shillings; Photograph—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after a tazza in silver, date 1683, the property of Sir W. C. Trevelyan, Bart., now in the South Kensington Museum. Dimensions—The same as the model.

[Photograph—One Shilling.]

CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.

Ornament.—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work executed after the portion shown in the photograph of the Pediment of a Gate (German work, date about 1700) in the South Kensington Museum, No. 5,979. To be adapted for use as a bracket. Dimensions—Twelve inches deep.

If the work is executed in brass or copper, it will be rendered subject to the conditions of these metals, either as split and riveted or partly beaten from the sheet, and the awards will be made in view of these conditions.

[Photograph—One Shilling and Threepence.]

CLASS 4.—CARVING IN IVORY.

(*a.*) *Human Figure in the round.*—One prize of £15 for the best, and a second prize of £10 for the next best, work executed after an ivory plaque of Bacchus and Amorini, by *Fiamingo*, No. 1,059, in the South Kensington Museum; dimensions—five inches greatest length; or after a medallion portrait of Flaxman, by himself, No. 294 in the South Kensington Museum. Dimension—To be reduced in height by one-half (linear).

[Cast of the Plaque—Two Shillings; and Photograph of the Plaque or of Medallion—One Shilling each.]

(*b.*) *Ornament.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work executed after a pair of *Tablets*, in the possession of John Webb, Esq. Dimensions—The same as the cast.

[Cast—One Shilling.]

CLASS 5.—CHASING IN BRONZE.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after a reduced copy of "*Clytie*." A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society at cost price—£2 10s.

[Plaster Cast—Three Shillings and Sixpence.]

(*b.*) *Ornament.*—One prize of £10 for the best, and a second prize of £7 10s. for the next best, work executed after *Goutier*, from a cabinet in the possession of Her Majesty the Queen. A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society at cost price—3s. 6d.

[Plaster Cast—One Shilling.]

CLASS 6.—ETCHING AND ENGRAVING ON METAL—NIELLO WORK.

Ornament.—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after arabesques by Lucas Van Leyden, A.D. 1528, No. 18,263 in the South Kensington Museum. To be engraved the height of the photograph, and, if round a cup or goblet, repeated so as to be not less than nine inches in length when stretched out.

[Photograph—Sixpence.]

CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's design of the "Three Graces,"* executed in *grisaille.* Dimensions—The figures to be four inches high.

[Photograph—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after a German arabesque (16th century), No. 13,063 in the South Kensington Museum. Dimensions—The same as the Photograph.

[Photograph—Sixpence.]

CLASS 8.—PAINTING ON PORCELAIN.

(a.) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's* "*Two Children*," in the cartoon of "*Lystra*." Dimensions—The same as the Photograph. This work is to be coloured according to the taste of the painter.

[Photograph—Ninepence.]

(b.) *Ornament.*—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after arabesques, by Lucas Van Leyden, 1528, No. 18,968 in the South Kensington Museum, and coloured according to the taste of the painter. Dimensions—Double the size of the Photograph (linear).

[Photograph—Sixpence.]

N.B.—A second set of prizes of the same amount is offered to female competitors. See conditions, Section VIII.

CLASS 9.—DECORATIVE PAINTING.

(a.) *Ornament.*—One prize of £5, and a second prize of £3, for a work, executed after an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum, No. 1,150. Dimensions—length 4ft.—width, enlarged from the print in the same proportion.

[Coloured Print—One Shilling.]

(b.) *Ornament.*—One prize of £5, and a second prize of £3, for a work, executed after a *picture frame*, in the South Kensington Museum, No. 7,820. Dimensions—5 feet by 3 feet 11½ inches, outside measure. The works to be executed on canvass, either with or without stretchers, in cool colours. Some lines of the mouldings may be gilt.

[Photograph—One Shilling and Sixpence.]

N.B.—A second set of prizes of the same amount is offered to female competitors. See conditions, Section VIII.

CLASS 10.—INLAYS IN WOOD (MARQUETRY, OR BUHL), IVORY OR METAL.

Ornament.—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after a specimen in the possession of the Hon. John Ashley. Dimensions—One-third larger than the lithograph (linear).

[Outline Lithograph—Sixpence.]

CLASS 11.—CAMEO CUTTING.

(a.) *Human Head.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Wyon's* heads of the Queen and Prince Consort, on the Juror's medal of 1851.

(b.) *Animal.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Wyon's* "*St. George and the Dragon*," on the Prince Consort's medal. Dimensions—The same as the casts.

[Casts—Sixpence each.]

CLASS 12.—ENGRAVING ON GLASS.

Ornament.—One prize of £10 for the best, and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, A.D. 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the engraving; and if round a glass or goblet, repeated so as not to be less than 9 inches long when stretched out.

[Photograph—Sixpence.]

CLASS 13.—WALL MOSAICS.

Human Head.—One prize of £10 for the best, and a second prize of £7 10s. for the next best, work executed after *Bertini*, of Milan. A preparatory drawing must be made, coloured, after the lithograph, on which the lines and disposition of the tesseræ must be marked. The dimensions of the work should be regulated by the size of the tesseræ proposed to be used, which size may be left to the choice of the artist. Although desirable, it is not necessary to execute the whole subject in actual mosaic, but if a part only be done, the eye must be in such portion. A coloured drawing, with tesseræ, may be seen at the Society's house, and in the South Kensington Museum, and tesseræ of two sizes may be obtained from Messrs. Minton, Stoke-upon-Trent, Messrs. Maw and Co., Broseley, Shropshire, Messrs. Powell and Sons, Temple-street, Whitefriars, and Messrs. Jesse Rust and Co., Carlisle-street, Lambeth.

[Lithographic Outline Coloured—Two Shillings.]

N.B.—A second set of prizes of the same amount is offered to female competitors. See conditions, Section VIII.

CLASS 14.—GEM ENGRAVING.

(a.) *Human Head.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after a cameo portrait of Savonarola, No. 7,541 in the South Kensington Museum. Dimensions—The same as the cast.

[Cast—Sixpence.]

(b.) *Full-length figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after a small Wedgwood medallion, No. 5,827 in the South Kensington Museum. Dimensions—The same as the cast.

[Cast—Sixpence.]

CLASS 15.—DIE SINKING.

Human Head.—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after the head of the Prince Consort, by *Wyon*, on the Society's medal. Dimensions—Half the size of the original (linear).

[White metal example—Sixpence.]

CLASS 16.—GLASS BLOWING.

Ornament.—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work executed after an original in the South Kensington Museum, No. 1,813. Dimensions—As given in the wood engraving.

[Engraving—Sixpence.]

CLASS 17.—BOOKBINDING AND LEATHER WORK.

(a.) *Bookbinding.*—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed in bookbinding, after an Italian specimen in the South Kensington Museum, No. 7,925. The work to be bound should be some classical author of the size given. Dimensions—The same as the photograph.

[Photograph—One Shilling.]

(b.) *Leatherwork.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work of boiled and cut leatherwork for the outside covering of a jewel casket. Original in the South Kensington Museum, No. 7,768. Dimensions—One-half larger than the photograph (linear).

[Photograph—One Shilling.]

CLASS 18.—EMBROIDERY.

Ornament.—One prize of £5 for the best, and a second prize of £3 for the next best, work executed, either after a German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum, No. 7,468, which may be adapted to a screen. Dimensions—According to the taste of the embroiderer.

[Photograph—German, Sixpence; Italian, One Shilling.]

CLASS 19.—ILLUMINATIONS.

Ornament.—One prize of £5 for the best, and a second prize of £3 for the next best, copy made from an Altar Card, attributed to Giulio Clovio, in the South Kensington Museum, No. 2,958, or from a MS. border, date 1450, No. 3,057, in the South Kensington Museum. Dimensions—One-half larger than the Photograph (linear).

[Photograph—Two Shillings.]

SECOND DIVISION.

CLASS 20.—WOOD CARVING.

(*a.*) *Human figure in the round, in alto or in bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still-life. Fruit, flowers, or natural foliage may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament, in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

NOTICE.

Any producer will be at liberty to exhibit, either in his own name or through his workmen, any work or works as specimens of good workmanship, in the above-mentioned classes, provided that the work or works be accompanied with a statement of the name or names of the artizans who executed their respective portions; and if the work or works be sufficiently meritorious, extra prizes will be given to the artizans who have executed them.

Artizans may, if they think fit, exhibit works executed by them after other designs than those stated above, in any of the above-mentioned classes. Such works may contain the whole or portions of the prescribed designs, and must be of a similar style and character. Competitors must specify the class in which they exhibit. If the works be sufficiently meritorious extra prizes will be awarded.

All articles for competition must be sent in to the Society's house on or before Saturday, the 22nd of December, 1866, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles, a description for insertion in the catalogue should be sent. The works will be exhibited at the Society's House, and afterwards at the South Kensington Museum. A selection will be made to be sent to the Paris Exhibition of 1867.

(By Order)
P. LE NEVE FOSTER,
Secretary.

April, 1866.

Proceedings of the Society.

TWENTY-FIRST ORDINARY MEETING.

Wednesday, May 2nd, 1866; William Hawes, Esq., F.G.S., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Field, James R., 113, 114, and 115, Fore-street, E.C.
Ford, Gerard, 8, Lincoln's-inn-fields, W.C.
Gibbon, Richard, Royal Brewery, Brentford, W.
Lapworth, Alfred George, 9, Canterbury-villas, Maida-hill, W.
Swallow, John Charles, School of Art, York.
Thompson, Reginald Ward, 21, Kensington-square, W.

The following candidates were balloted for and duly elected members of the Society:—

Fraser, George C., 62, Tredegar-square, Bow, E.
Grist, Richard, Brimscombe, Gloucestershire.
Knatchbull, Wyndham, 3, Chesham-place, S.W.
Silvy, Camille, 38, Porchester-terrace, W.
Spence, Charles Stenson, Shannon-street, Mark-lane, Leeds.
Tarner, A. Phythian, 3, Upper Baker-street, N.W.
Thorp, Henry, 27, Piccadilly, Manchester.
Ward, John, 13, Donegall-place, Belfast.

The Paper read was—

ON NATIONAL STANDARDS FOR GAS MEASUREMENT AND GAS METERS.

By GEORGE GLOVER, ESQ.

Formerly Lecturer on Natural Philosophy, Royal College of Surgeons, Edinburgh, and Vice President Royal Scottish Society of Arts and Superintending Medical Inspector, General Board of Health, Whitehall.

The subject of gas measurement, which I am about to have the honour of bringing under the notice of the Society, involves the consideration of two kinds of instruments—gasometers and gas meters. The gasometers are of two kinds—the "National Standard Gasholders" deposited at the Exchequer, and those in ordinary use, generally called "testing gasholders." The gas meters are also of two kinds—the wet and the dry.

When, more than half a century ago, coal-gas came into use, the want of a measure for its sale was soon felt. Such a measure was perceived to be indispensable in the event of gas becoming a staple article of commerce. To meet this want, Mr. Samuel Clegg invented the instrument which, from its revolving drum or measuring parts being partially submerged in water, has been denominated "The Wet Meter." Ingenious in principle, it was soon found defective in practice. Its principal defect arises from the evaporation of the water causing constant variation in its measuring capacity. The bottom of the measuring chambers is defined by the plane of water in the meter, and the measuring chambers are diminished or enlarged by the accidental quantity of water which may be present at any given instant. The water is continually undergoing change of level from evaporation, which is more or less rapid according to the quantity of gas which passes through the meter, and the change of temperature. The wet meter likewise varies in its measurement with every departure from the true horizontal plane. Inclined forwards, it measures too slow; if backwards, it measures too fast. It also varies with the varying pressure of the gas as it enters the meter. To render a wet meter a fixed measure four things are essential:—

1. That the plane of the water remain fixed:
2. That the bottom of the meter be parallel with the plane of the water:
3. That the meter be placed and maintained on a horizontal plane:
4. That the pressure of the gas as it enters the meter be uniform.

Compliance with these conditions is impracticable, and it is much to be regretted that the baffled ingenuity and futile devices of half a century have not made this conviction general; and that, at the present hour, there should be large towns, such as Liverpool, Birmingham, Sheffield, and several in Scotland, in which gas companies, to their own injury and that of the public, still adhere to the wet meter, notwithstanding its acknowledged defects.

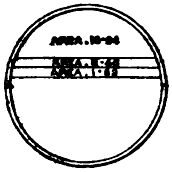
It has been customary, in cases of doubt as to the accuracy of the measurement of gas by wet meters, to

lift them from their place, to put them on a horizontal plane, and to adjust the level of the water to a plane of correct measurement. Such a test is no more a proof of a meter's correct performance than a watchmaker's setting a watch to Greenwich time would be an evidence of the watch having gone correctly for the twelve months past, or a guarantee of its accuracy for the twelve months to come. The only correct method of testing the wet meter's performance during any given time it may have been in use, is to examine the internal surfaces of the back and front plates where the water at its various levels has traced or oxidised distinct lines. In a three-light meter, the distance between the two extremes (viz., the highest and lowest water-line) ought not to exceed 3-16ths of an inch, so as to give the variation of 5 per cent. allowed by the "Sales of Gas Act;" whereas, in practice, that distance is found to reach an inch, or even more; thus showing, of course, a proportionate amount of variation in the measuring capacity of the meter. The diagrams (fig. 1) will illustrate this:—

FIG. 1.

DIAGRAMS OF WET METERS, SHOWING THE PRECISE AMOUNT OF VARIATION.

Highest Water Line.
Lowest Water Line.



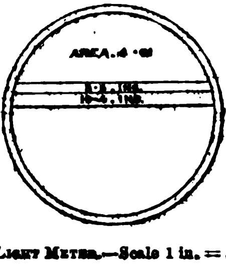
Correct Water Level.

TWO-LIGHT METER.—Scale 1 in. = 1 ft.

Registering 33 per cent. against Consumer.
Do. 7 do. against Company.

	sq. ins.
Area of segment down to correct water level, 16·94 + 8·46 =	25·40
Do. to highest do.	16 94
Against Consumer—variation..........	8·46
Then as 25·40 : 8·46 : : 100 : 33·3 per cent.	
Area of segment down to lowest water level........................	27·22
Do. to correct do.	25·40
Against Company—variation	1·82
Then as 25·40 : 1·82 : : 100 : 7·16 per cent.	

Highest Water Line.
Lowest Water Line.



Correct Level of Water.

FIVE-LIGHT METER.—Scale 1 in. = 1 ft.

Registering 9 per cent. against Consumer.
Do. 29 do. against Company.

Area of segment down to correct water level =	45·31
Do. to highest do. =	41·81
Against Consumer—variation	3·5
Then as 45·31 : 3·5 : : 100 : 8·96 per cent.	
Area of segment down to lowest water level ...	58·71
Do. to correct do. ...	45·31
	13·4
Then as 45·31 : 13·4 : : 100 : 29·49 per cent.	

There has been no lack of effort to remove this defect in the wet meter. Ingenuity, labour, and vast sums of money, have been lavished upon it. The Patent Office, year after year, has been besieged by inventors who imagined they had discovered a remedy; but, for all practical purposes, there has been little, if any, improvement on the original invention.

The inventions which have aimed at preserving a fixed water-line may be reduced to three classes:—Those having a reservoir or small cistern in connexion with the meter, and a tube communicating with the surface of the water in the meter, on the principle of a bird-fountain; those in which a spoon or bent tube on the axle lifts a small quantity of water in each revolution by dipping into a cistern or water-box; those which float the drum itself, or have a float nicely balanced, of semicylindrical or hemispherical form, turning on a horizontal axle mounted near the level of the water in the meter. Many of those inventions have, from time to time, obtained partial success. Some of them have been revived, again and again, under different names, and with slight modifications, but all of them have ended in failure and disappointment. The method of floating the drum Mr. Clegg invented shortly before his death. The simplicity and theoretical beauty of the invention are apparent; and, could the sides of the revolving drum be kept vertical to the plane of water, the drum itself perfectly balanced and free from deposit; could the water be kept pure, the pressure of the gas free from variation, and the moving parts from corrosion, it might be hoped that one serious practical objection to the wet meter had been removed. These conditions, however, all experience has shown cannot be realised.

Vigorous efforts are being made to revive the use of a meter, constructed on the same principle of floatation, which was patented by Messrs. Sanders and Donovan in 1855. Theirs is the simplest and most scientific invention yet propounded for preserving the uniform level in the water-line. Its ingenuity reflects high credit on the inventors. But, without unfairly detracting from this, it may be stated that their invention has increased both the size and complexity of the instrument; that its extreme delicacy and the complication of its parts, while multiplying the chances of error in its workmanship, expose it to quicker decay; and hence repair and replacement are necessarily more frequent. Its delicacy, in fact, unfits it for everyday use, and makes it very liable to derangement. The water in the meter becomes impure and even tarry; impurities, from time to time, are deposited on the float; its balance is impaired; its axle and the float corrode; small holes are formed in it by corrosion through which the water enters, when it ceases to be a float,—so that it not only fails to adjust the level of the water, but becomes more defective than the ordinary wet meter.

It is open, besides, to the very serious objection that, by unscrewing the lower plug, as much gas can be got as from the outlet of the meter itself, a circumstance which offers a strong temptation to fraud.

The variation in measurement is, of course, the grand objection to the wet meter. It is not the only one, however. Though fatal in itself, there are others I may just mention. There is the annoyance from the unsteadiness of the lights, familiarly called "jumping." There is the danger of sudden extinction. There is the danger of escapes of gas through the meter being interfered with, as when the plugs are removed that the water may be replenished, and, through carelessness, not replaced. There is the facility with which the measurement in the same wet meter can be made to vary, either from the quantity of water put into the meter, the inclination given to it, or from both, and the consequent temptation to fraud. There is the necessity of placing it in the basement of the house, and the consequent attempt to prevent the "jumping" of the lights by giving all the pipes a gradual rise from the meter to admit of the water trickling back into it, an attempt at once futile, expensive, and injurious to house property. Its very situation in obscure out-of-the-way corners is apt to create a suspicion in the mind of the consumer that he is wronged in his measurement, while the gas companies are made dependent on the vigilance of their inspectors to an extent undesirable alike for the employer and the employed. The defects of the wet meter too often expose the managers and directors of gas companies to unjust suspicions,

while really the companies are the greatest losers by it, and the parties most deeply interested in the just measurement of gas. When the meter is found not to have registered at all, or to have registered only a small portion of the gas passed through it, it is not unusual to ask the consumer to pay for his gas without any reference to the meter, but to his payment for the corresponding quarter of the previous year, a mode of adjustment unsatisfactory both to the seller and the buyer.

The interests of the public and the gas companies alike demanded that the evils of a system of measurement which involved variations reaching sometimes as high as 20 and 30 per cent. should be fairly met. "Why," it was asked, "should not gas be justly measured as other staple commodities are measured? Why should not the consumer have a guarantee that he really gets the quantity he pays for, and the producer that he really gets payment for the quantity he delivers? If security be given for the just measurement of a gallon of oil and a pound of candles, it is not less necessary for a cubic foot of gas." From evidence given before Parliamentary Committees, it appeared that, owing to the want of a legal criterion and inspection, what was called a cubic foot differed, when measured by the meters of one manufacturer as compared with those of another, as much as 3 per cent., and that, when the meters were in the most perfect working condition. The prevailing dissatisfaction and the antagonism, prejudicial alike to the gas companies and the public, to which this state of things gave rise, at length drew the attention of the Legislature to the subject. The result was the bill presented by Lord Redesdale, to the House of Lords, in the first session of 1859, for the purpose of establishing a standard cubic foot for gas measurement, and extending the general law of inspection of weights and measures to gas meters, with such other provisions as the special nature of the subject seemed to require.

The "Sales of Gas Act" introduced by his Lordship received the sanction of the Legislature in the session of 1859. The principal provisions of that Act are sufficiently well known. It fixed, for the first time, as the "only legal standard or unit of measure for the sale of gas by meter, the cubic foot, containing 62·321 pounds avoirdupois weight of distilled or rain water weighed in air at the temperature of 62° of Fahrenheit's thermometer, the barometer being at thirty inches." And had the Act done no more than this it had conferred an important boon on the gas companies and on the community at large. A first and important step was then taken in the right direction.

The duty, of providing standard measures for gas, was devolved by the Act on the Lords Commissioners of Her Majesty's Treasury. The Astronomer Royal's familiarity with the subjects of the standards of weights and measures specially qualified him for such a duty, and his services to the Exchequer in connection with this subject having been acknowledged as of high value, their Lordships applied to him to assist them in providing the requisite instruments. The public and the gas companies were entitled to expect that the services of a philosopher so distinguished, in the application of the exact sciences, should be made available to attain, in the standard measure for gas, as much accuracy as possible.

Acting under the authority of the Lords Commissioners, and aided by Professor Miller, of Cambridge, the Astronomer Royal provided a bottle for measuring the cubic foot defined in section ii. of the Act. In his report to their Lordships of the 11th Feb., 1860, he says, "Acting under the authority given by your letters of October 14th and 15th, 1859, and having secured the valuable assistance of Professor W. H. Miller, I caused to be prepared a weight of 62·321 pounds, constructed of hard gun-metal, and a metallic vessel or bottle, intended to contain one cubic foot, constructed of thin copper, in shape a cylinder, with a cone at each end; the upper cone having a small cylindrical neck for the introduction of water, and the lower one having a tap for its discharge." Whether the bottle (fig. 2.), so described,

FIG. 2.

CUBIC FOOT BOTTLE.

Scale ⅛ full size.

was the best instrument for the purpose may, I thi[nk] fairly questioned. Made of copper, it was liable to [cor]rode. The thin sheet of copper was liable to chang[e] form when filled with water, as well as from extern[al in]jury. Once filled, it could not be readily dried. I [submit] that a geometrical solid made of anti-corrosive m[etal] made to exclude, not to contain, the water, and losi[ng] weight the precise quantity of distilled water de[fined] in clause ii., would be free from the objections stated, [and] could be easily dried after each experiment. It cou[ld be] preserved, if laid on a soft cushion, under a glass, at [the] Exchequer, for any length of time, without change [or] diminution.

Having obtained a bottle fitted to contain [the] "unit of measure" required by section ii. of [the] Act, the Astronomer Royal's next step was to a[pply] it in accordance with section iii., which requires th[at] "within three months next after the passing of the A[ct] models of gas-holders measuring the said cubic fo[ot] and such multiples and decimal parts of the said cu[bic] foot as the Lord High Treasurer or the Commission[ers] of Her Majesty's Treasury shall judge expedient, sh[all] be carefully made, with proper balances, indices, and ap[pa]ratus for testing the measurement and registration [of] meters, and such models shall be verified under the [di]rection of the Lord High Treasurer or the said Co[m]missioners, and, when so made and verified, shall [be] deposited in the office of the Comptroller-General of [the] Exchequer at Westminster."

In carrying this enactment into effect, it was f[ound] that none of the gas-holders hitherto in use for test[ing] meters could be adopted as a standard measure. T[he] more prominent objections to them were these:—

1. Their measuring part was not truly cylindrical.

2. No two gas-holders agreed in measurement. Not only did they differ from each other to the extent of 3 or 4 per cent. in their measuring capacity, but the various divisions into feet, and the sub-divisions of the feet, differed in the same gas-holder.

3. The material of which they were made was very liable to corrosion when in contact with gas and water. To retard this corrosion paint was used. The paint in the inner surface of the bell diminishes its measuring capacity, and its renewal from time to time aggravates the evil. The coating of paint softens, swells, frequently rises in blisters, falls off in flakes, or crumbles away. In its ascent from the cistern, the painted surface of the bell brings with it a quantity of water, which adheres to it in the form of a film, and numerous drops which are especially on the inner surface of the flat cover. This occasions a further diminution of capacity, whilst the evaporation of the water on the outer surface of the bell ... temperature, diminishes the volume of the gas contained, and causes error in the testing of meters.

4. The scales of the existing gasholders were found liable to corrosion, and, not being attached to the bell, they could be readily tampered with. These reasons were sufficient to preclude their adoption as standard measures.

The construction of such instruments as the Act required becoming daily more pressing, and urgent representations being made to the Treasury on the subject, I submitted my designs to the Astronomer Royal, and I had the honour to be employed by the Lords of the Treasury to superintend the construction of the "National Standard Gasholders, with proper balances, indices, and apparatus for testing the measurement and registration of meters."

The idea of a legal standard measure, I need scarcely say, involves the highest attainable accuracy. Neither the legislature nor the public would be satisfied with anything short of this. The subject of weights and measures, even for solids and liquids, for length and weight, is one of much practical difficulty. The records of the Royal Society abundantly testify how much time, labour, and thought have been given to the solution of these apparently simple questions—"What is a pound weight?" "What is a yard?" Not to travel back into the remote past, I need only remind you of what happened when the Houses of Parliament were destroyed by fire in 1835, and the yard measure perished with them. A Royal Commission was appointed to restore it. After deliberating some twelve years they could find nothing fixed, either in time or space, to which to appeal for a standard measure. Neither the seconds pendulum nor the arc of the meridian of the French philosophers could be appealed to; and they had no alternative but arbitrarily to decide that the rod they had deposited at the Exchequer was a yard. But in constructing a standard measure for gas, the difficulties are much more complicated. The body to be measured is an aëriform body, invisible, highly elastic, varying in volume with every barometric change, very complex in its chemical constitution, affected by every change of temperature, liable to condensation, and to be absorbed by water, of which it is also an absorbent.

The National Standard Gasholders were made at the works of Messrs. Bryan Donkin and Co., whose well-known accuracy in workmanship and perfect machinery for drawing truly cylindrical tubes of large size, recommended them for such an undertaking. They were constructed under my direction and constant superintendence. In constructing the instruments, the various properties of gas, I have just named, had to be taken into account, and the following conditions were laid down as essential:—

1. That they should be composed of a non-corrodible metal capable of resisting the chemical action of the constituents of coal gas and water.

2. That the surface of the bell should readily part with water.

3. That the bell, or measuring part of the instrument, should be a truly cylindrical vessel and sufficiently rigid to resist change of form from the application of any ordinary forces.

4. That it should have a correct scale engraved upon it to indicate its capacity in cubic feet, and the subdivisions of the feet into minute fractional parts.

5. That it should be correctly balanced, and that a part of the counterpoise, suspended by a cord passing over a spiral, should preserve its equipoise at various depths of its immersion in the water in the cistern.

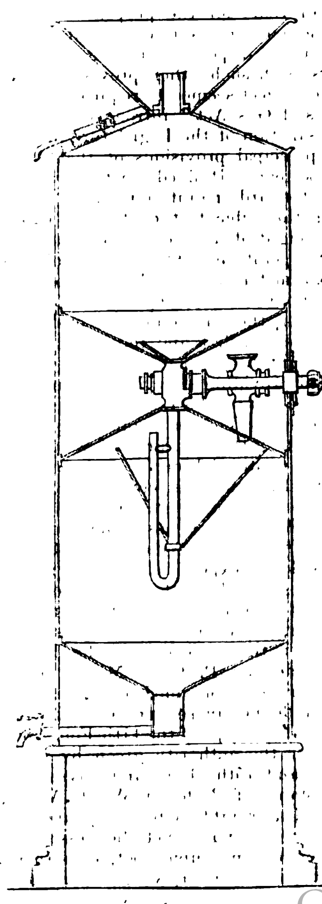
6. That the sides of the bell should be maintained vertical in its ascent and descent.

7. That the taps should be lined with the anti-corrosive alloy, and the density of their rubbing surfaces be so varied as to reduce their friction to a minimum, and secure their durability and soundness.

8. That the different parts of the instrument should be so perfectly adapted to each other, that when put together as a whole, it should work easily, steadily, and correctly.

The standards having been constructed, the next point of difficulty was the application of the cubic foot bottle in graduating them. Their graduation involved nice scientific considerations, and a series of experiments requiring much delicacy and care. I may here state that in the graduation and experimental adjustment of the

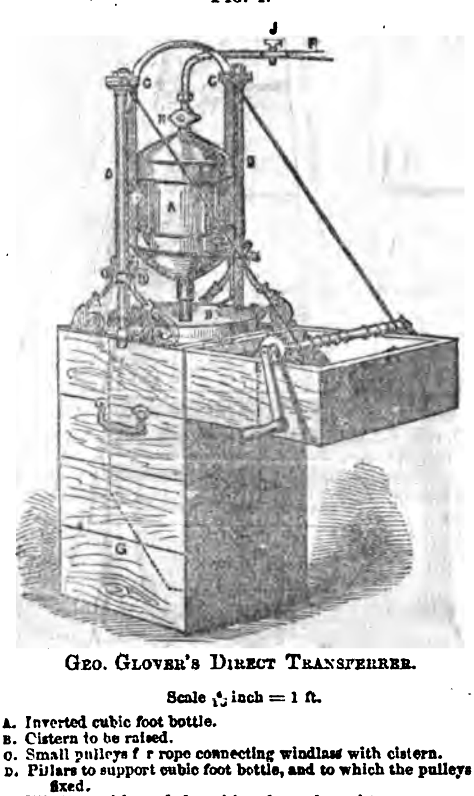
Fig. 3.



The Indirect Transferrer.

standard gas-holders I received most valuable assistance from Mr. William Greme Tomkins, C.E., who was afterwards employed at the Exchequer in the application of the standards in the verification of the gas-holders for testing meters furnished to the local authorities, and in this his engineering knowledge and experience in the manufacture and use of instruments of precision was of great service. Though the cubic foot bottle already described was accurately adjusted for containing the "legal standard and unit of measure," there was no method known by which it could be used in measuring gas, or in the graduation of holders. An instrument called a "transferrer," of which I give a diagram (fig. 3), was resorted to. It consisted of "an upper chamber containing exactly the volume of one cubic foot, and adapted, with proper arrangement of cocks and pipes, by repeated discharges of the water filling the upper chamber into the lower chamber, to discharge in succession any number of volumes of air, each of one cubic foot, into any vessel properly prepared for their reception." This instrument was resorted to without any satisfactory result. It was open to serious objections. The filling of the bottle produced agitation of the water, displacing air from the water, and entangling variable quantities of it in minute bubbles, many of which adhered to the inner surface of the bottle. Every means which suggested itself was tried to make it available, but these giving no satisfactory result, it was laid aside. Analogous methods were tried of transferring the exact cubic foot of air to the gasholder, but with hardly more success. A closer approximation in some instances was obtained, but the uniformity was not such as to justify their adoption in

FIG. 4.



GEO. GLOVER'S DIRECT TRANSFERRER.

Scale $\frac{4}{10}$ inch = 1 ft.

A. Inverted cubic foot bottle.
B. Cistern to be raised.
C C. Small pulleys f r rope connecting windlass with cistern.
D D. Pillars to support cubic foot bottle, and to which the pulleys are fixed.
E. Windlass with ratch for raising the tank or cistern.
F. The exit pipe from bottle.
G. The box in which the whole instrument is enclosed.
H. Window covering the aperture made by the withdrawal of the plug of the tap of the bottle.
I. Tap betwixt bottle and holder.

the division of the scale. At last it occurred to me that, instead of using the bottle indirectly, it might be used directly, the second vessel being dispensed with. The diagram (fig. 4) will explain the process.

1. The bottle was inverted.
2. The plug was drawn out.
3. The openings caused by the withdrawal of the plug were closed with glass.
4. A piece of leaden tube was soldered to the end of the tap.
5. This tube was connected with the gasholder to be tested.
6. A cistern containing distilled water was placed below the bottle thus secured in a fixed vertical position.
7. The cistern was raised steadily, without the water being agitated, through the entire length of the bottle, until the water reached the point where the plug of the tap, had it been retained, would have stopped it, and the entire volume of air, viz., one cubic foot, defined by the contents of this bottle, was found to have been transferred to the gas holder.

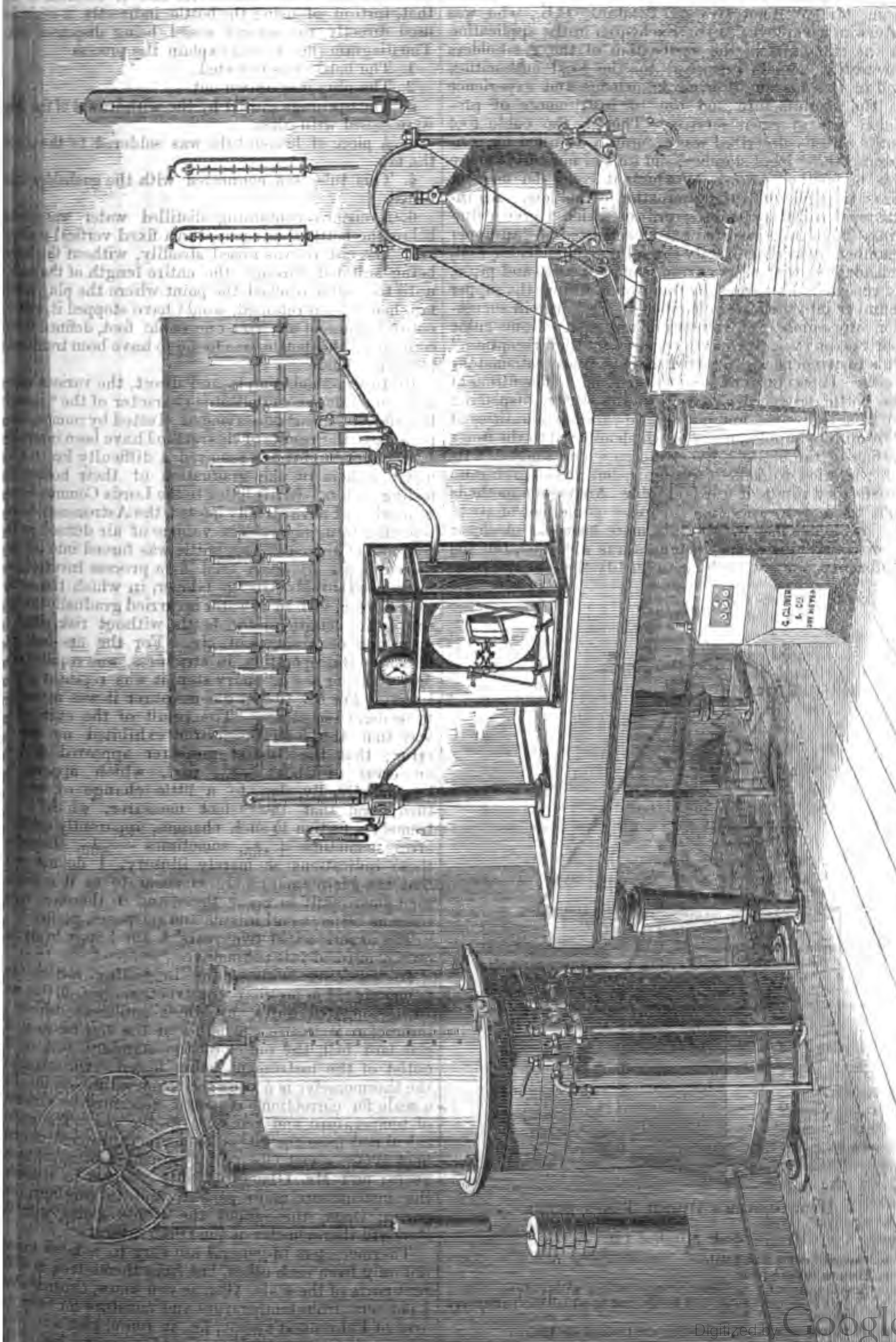
By this method, simple and direct, the various errors occasioned by the complicated character of the "indirect transferrer" are at once avoided. Tested by numerous experiments, the results of this method have been invariably satisfactory, and it has removed a difficulty long felt by meter makers in the graduation of their holders for testing meters. In his letter to the Lords Commissioners, from which I have already quoted, the Astronomer-Royal, referring to it, says, "The volume of air defined by the contents of the cubic foot bottle was forced into the gas-measurer (fig. 5) under trial by a process invented and introduced by Mr. George Glover, in which the nearly undisturbed surface of water is carried gradually through the entire length of the bottle without risk either of absorbing or giving out air. For the one-foot gas-measurer this operation, in strictness, was required only once (but, as a cautionary step, it was repeated several times). For the 10-feet gas-measurer it was necessarily to be done ten times. The result of the examination was that the 5-feet measurer exhibited no trace of error; that the 10-feet measurer appeared to show an error of about $\frac{1}{5000}$ part, which appeared to be undoubtedly due to a little change of temperature; and that the 1-foot measurer, which is extremely sensitive to such changes, apparently exhibited errors, sometime $+\frac{1}{500}$, sometimes $-\frac{1}{500}$. Regarding these indications as merely illusory, I do not doubt that the gas-measurers are as accurate as it is possible for human skill to make them, and I therefore report them as being, to all intents and purposes, perfect."

The experience of five years, I am happy to say, has only confirmed this testimony.

In verifying holders, and in testing meters, thermometers of a peculiar construction (fig. 6) are used with elongated bulbs, by which sufficient delicacy of indication is insured, whether of the testing-room, the standard bell, the outlet of the standard bell, or the outlet of the instrument being tested. On one side of the thermometer is a scale for temperature, on the other a scale for corrections rendered necessary by variations of temperature and moisture in the gas. The scale is calculated from the tables for temperature and moisture kept at Greenwich Observatory during a period of twelve years; and Mr. Glaisher kindly assisted in rendering the instruments more perfect, and in carefully comparing them, throughout the whole scales, with the standard thermometer at the Observatory.

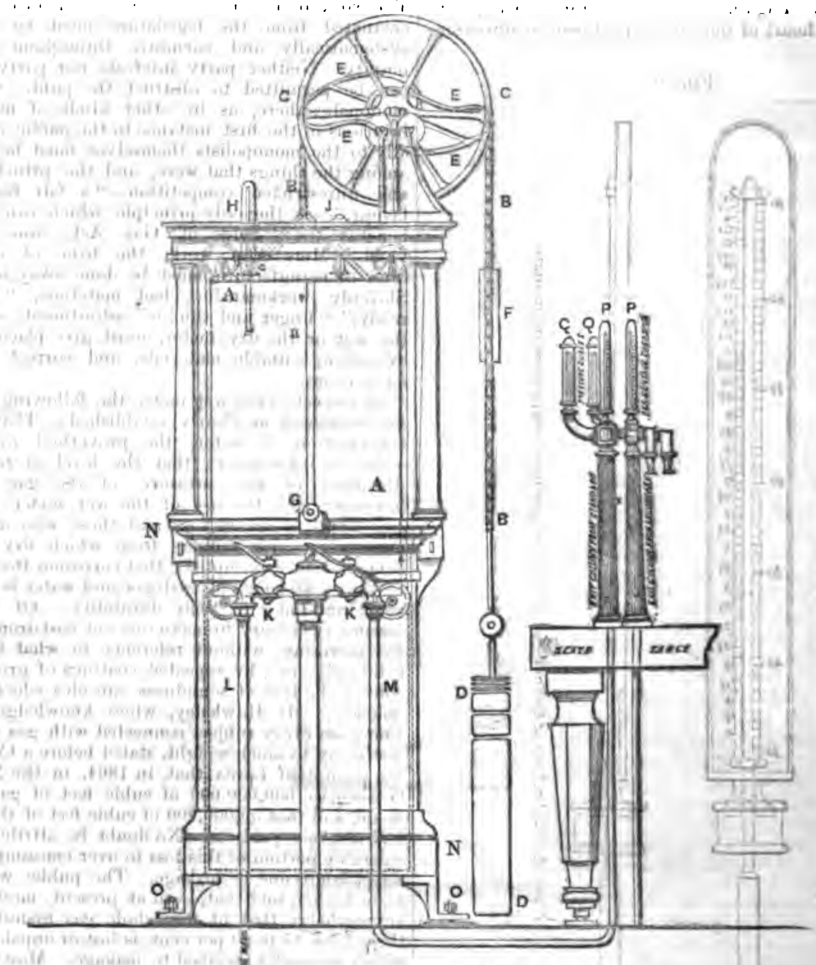
Thermometers in general use vary to a large extent, not only from each other, but from themselves, in different parts of the scale. Gas, as you know, expands about ¼ per cent. from temperature and moisture for every degree of Fahrenheit's scale, *i.e.*, in round numbers, about 5 per cent for twenty degrees. Gas coming out of the ground at the temperature of 40° would increase 5 per cent. in this room if the temperature were 60°.

In fixing a unit of measure, and providing standards of



ORGE GLOVER'S PATENT STANDARD GASOMETER, METER, AND DIRECT TRANSFERER.

Fig. 5.



Geo. Glover's Standard Gas Holder.

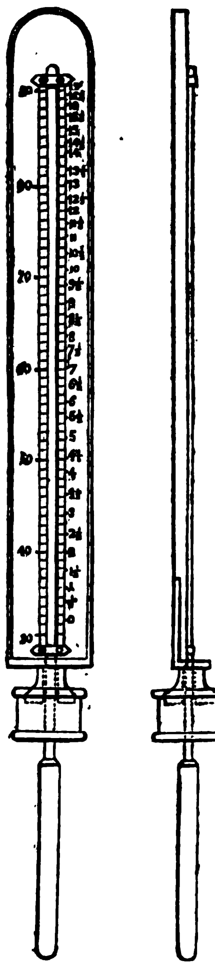
A A. Inverted cylindrical vessel, commonly called the bell.
a. The scale engraved on the bell.
B B. Chain or band by which the bell is hung.
C C. Wheel or pulley over which the chain or band works.
D D. Counterbalance weight for the bell: upper parts movable, so as to give the two pressures required by clause 13 of the Act.
E E. The cycloids or spirals fixed on the pulley shaft, and balancing each other.
F. A counterbalance weight attached to the extremity of one of the cycloids to maintain the true balance of the bell at varying depths of the water.
G. Microscope for reading the scale.
H. Thermometer on the bell.
J. Pressure-gauge on the bell.
K K. Taps.
L. Inlet pipe.
M. Outlet pipe.
N N. Cistern or tank.
O O. Adjusting screws for levelling cistern.
P P. Thermometers on testing table.
Q Q. Pressure gauges on table.

measure of the highest attainable accuracy, the "Sales of Gas Act" has rendered a great and valuable service. And here I am reminded of the language employed by the famous Laplace, when speaking of national standards for weights and measures generally:—"We cannot reflect on the prodigious number of measures in use, not only among different nations, but even in the same country, their capricious and inconvenient divisions, the difficulties of determining and comparing them, the embarrassments and frauds they occasion in commerce, without regarding, as one of the greatest benefits, the improvements of science and the ordinances of civil government can render to mankind, the adoption of a system of measures, of which the divisions being uniform, may be easily derived in calculations, and which may be derived in a manner the least arbitrary from the fundamental magnitude indicated by itself. A nation that would introduce such a system would unite to the advantage of reaping the first fruits of the improvement, the pleasure of seeing its example followed by other countries, of which it would thus become the benefactor."

And so, in the present instance, we are already reaping the fruits of the "Sales of Gas Act." A great advance towards correct measurement has been effected. The inaccuracy of the meters in general use hitherto has been fully established. The companies and the community can now be protected. So far the legislature has done its duty. Lord Redesdale's Act carried legislation as far as the present state of our information justified; and it avoided the grave error of going beyond it. The prudent and wise course for government to pursue is clear. It is at once its duty and its interest to protect, encourage, and give every facility to a manufacture so intimately connected as gas is with the public welfare

And here, I may remark, in passing, that the clamour now being raised against gas manufactories being conducted in the heart of our cities and towns is unreason-

FIG. 6.



SCALE OF TEMPERATURE.

The right-hand column of figures shows the per-centage due to temperature and moisture.

able. It has gained strength from the recent explosion of a gas-holder not far off,—a circumstance which has excited needless apprehensions. No occurrence could be more exceptional. I believe it is without precedent; and it arose from a circumstance which might easily have been prevented. When, in 1854-55, I had the honour to be instructed by Sir Benjamin Hall (now Lord Llanover) to examine and report on the gas works of the metropolis, for his guidance, with reference to the "Nuisances Removal Act," I reported that gas works could be conducted in populous neighbourhoods without being a nuisance or injuring the public health. Legally to constitute a nuisance three things must be established:—a noxious element in sufficient quantity; that element in sufficient intensity and in continuous action; and gas-works were not declared such a nuisance. To science, in fact, and not to legislation, must the public look for the removal or mitigation of any evil or danger which they may occasion.

But, to return; the government having done its duty, it should be the endeavour, as it is the interest, of meter manufacturers to produce meters such as will satisfy the just demands of the public. The work of reform in the measurement of gas which emanated from the legislature must be carried on systematically and earnestly throughout the community. Neither party interests nor party prejudices can be permitted to obstruct the public weal. Old monopolies here, as in other kinds of manufacture, injurious in the first instance to the public, and eventually to the monopolists themselves, must be considered among the things that were, and the principle of free and unrestricted competition—"a fair field and no favour,"—as the only principle which can secure the benefits the "Sales of Gas Act" was meant to yield. Mere slop work, the bane of every other kind of manufacture, must be done away with in this. Slovenly workmanship, bad materials, "rough and ready," "finger and thumb" adjustment, whether of the wet or the dry meter, must give place to careful execution, suitable materials, and correct mechanical adaptations.

In respect to the wet meter the following points may be considered as clearly established:—That, with the introduction of water, the proverbial instability of water is introduced; that the level of the water is disturbed by the pressure of the gas constantly varying; that the use of the wet meter exposes the companies to severe loss, and those who use them to annoyances and dangers from which dry meters are comparatively exempted; that corrosion from the action of the constituents of coal-gas and water is actively at work and fatal to their durability. Of late it has become customary to make cases of cast-iron, to conceal the corrosion, without reference to what is going on internally, and, by repeated coatings of green paint, to convey the idea of soundness—an idea which is simply delusive. Mr. Hawksley, whose knowledge and experience on every subject connected with gas entitles his testimony to much weight, stated before a Committee of the House of Lords that, in 1864, in the Nottingham Gas-works, 330,000,000 of cubic feet of gas had been made, and that 50,000,000 of cubic feet of that quantity had not been paid for. No doubt he attributed a considerable portion of this loss to over consumption in the street lamps and to leakage. The public will be astonished when told that, even at present, most companies acknowledge that of the whole gas manufactured by them from 15 to 20 per cent. is lost or unpaid for; a loss which is usually ascribed to leakage. Most gas companies, as a rule, have no correct method of ascertaining the exact amount of loss; but, whenever the question is carefully gone into, and accurate methods of measurement applied, the loss out of profits is found to be from 20 to 25 per cent., and, in some instances, even more. About 15 per cent. of this loss may fairly be put down to defective meters. The tenacity with which many companies have clung to the wet meter, and their efforts to maintain it, have been in no small measure owing to the want of a suitable substitute, and the failures which, with one exception, have marked the history of the dry meter manufacture. These failures may be traced to one or other of the following sources:—The inadequate scientific knowledge of the manufacturers themselves; the complexity of the conditions the manufacture involves; the error of adopting angular movements in the measuring chambers instead of direct action: the use of rotary valves; the difficulty of arriving at the combination of metals in such definite ratios as to constitute a true alloy, the uniform density and structure of which shall be such that, when manufactured into a D slide valve, the rubbing surfaces shall wear equally, and the perfect soundness of the valve shall be maintained.

The dry gas meter has been brought to its present condition of excellence by successive stages. The essential improvements, invented by Mr. William Richards, and patented by Messrs. Croll and Richards in 1844, consisted in the introduction of the diaphragm and the direct action of the disc. The theoretical accuracy of

the principles, which the invention of Mr. Richards involved, time and experience have fully established. The patentees, however, failed to reduce those principles to practice in producing a good and durable instrument, and they abandoned its manufacture. Mr. Croll having secured the patent, Mr. Thomas Glover, in 1845, commenced the manufacture of the meter, as Croll and Glover's patent dry gas meter, and ultimately he manufactured it as his own, having from time to time introduced such improvements on the meter as experience pointed out to be necessary to render it a reliable gas-meter. To him belongs the merit of having imparted to Mr. Richards' invention a real and practical value by the production of a correct and durable instrument.

And here I may be allowed to refer to certain improvements made in the dry gas meter by myself. The meter of Messrs. George Glover and Co. has a large and distinct dial, which shows at a glance the number of cubic feet of gas passed; the number of the meter's capacity per hour and per revolution, and the marks of identity, all of which the "Sales of Gas Act" requires, the maker's name, and the date of the manufacture. These points of information are inscribed on an enamelled dial in legible and indelible characters; and they are necessary for reference, especially when disputes arise between buyer and seller, in which case the marks of identity and capacity are essential. These should not be entrusted to flimsy badges of thin metallic substances, which become tarnished and illegible, accidentally fall off, and can easily be transposed for fraudulent purposes.

A slot is introduced in our manufacture, and a pin which connects the valve and valve rod. This facilitates the adjustment of the two sets of valves necessary to the uniform flow of gas, without which steady lights cannot be obtained. The attempt to adjust the position of the valve pin by giving a curvature to the valve arm is very objectionable. The valve arm has to be made soft, so as to admit of this finger and thumb adjustment, its protracted immersion in gas rendering it still softer. The result is that the rod becomes more or less curved during the action of the meter as it transmits force, in the direction of its length, as a thrust or as a pull alternately.

Another improvement I have effected is the introduction of a slot in the tangent of the meter, and the placing a shoulder or rest on the tangent pin, the flat surface of which rests on the upper surface of the tangent. The pin is secured in its place by a screw from below, the flattened head of which fixes it firmly at any desired point of the slot. This arrangement keeps the pin in a perfectly vertical position, and admits of the meter being registered with care and precision. To secure uniformity we stamp the cases and internal parts of our meters. This we do by steam power, and we are thereby enabled to effect a saving in their production.

To reduce to practice the idea of a machine for the accurate measurement and correct registration of gas the experience of half a century has shown to be no easy problem. The construction of a good and durable dry gas meter involves a multiplicity of chemical and mechanical considerations, to each of which its due weight must be assigned.

As I said, when speaking of the standards, a subtle, invisible, elastic, aëriform body, very complex in its chemical constitution, susceptible of change in condition and volume from slight variations in temperature and pressure, has to be accurately measured, and the result of that measurement must be accurately recorded. The instrument must be self-acting, and must act in a closed chamber, continuously or at intervals, requiring no adjustment or interference of any kind. All its parts which come in contact with gas must be made of anti-corrosive metal; while the materials, forms, and combinations of its different parts must be so arranged and so adapted to each other that, when put together as a whole, it shall work easily, steadily, and correctly.

Many have a strong prejudice against using leather in dry gas meters. This prejudice is well-founded when the leather is not properly prepared for gas, or when it is used as a hinge for the doors of the measuring chambers in meters of oblique action, when it is liable to give way. But when it is properly prepared for the reception of gas, which contains carbolic acid or creosote—an excellent antiseptic for animal texture—and its flexibility is used to a limited extent, it will remain sound and pliable for any length of time. The dry gas meter, in fact, obviates, I respectfully submit, all the objections to the wet meter. I may be allowed to state *seriatim* its different points of superiority.

1. It measures accurately, and does not vary in its registration.

2. It does not cause jumping, or sudden extinction of the lights, the former a common source of annoyance, the latter not free from danger, especially in large assemblies, and on railway lines where signal lights are used.

3. It does not require to be opened that water may be put into it; thus escapes of gas from the plugs being carelessly left open, always offensive, and occasionally producing explosions, are averted.

4. It cannot be tampered with without showing distinct evidence of having been so; and it is thus free from the many temptations and facilities to fraud which are characteristic of the wet meter.

5. It does not allow the gas to pass without being registered, a source of much greater loss to companies th[illegible] is commonly supposed, and which is caused by the wa[illegible] level falling to a point at which the gas passes unregistered.

6. The frequent supply of water now rendered necessary by the small range of error allowed by the "Sales of Gas Act," the vigilant attention required to pre[illegible] fraud, and to ascertain when the gas is passing unre[illegible] tered, need three times the number of inspectors [illegible] site where dry meters are used; whilst in testing [illegible] the expense of inspectors and instruments is three [illegible] as great with the wet with the dry meter, which [illegible] effects a great saving to gas companies and to [illegible] authorities.

7. The dry meter does not require to be pl[illegible] in the basement or lower part of the house, [illegible] may be put anywhere. The attempt with wet meter[illegible] prevent jumping of the lights by giving all the pi[illegible] gradual ascent of the meter, so as to admit of the w[illegible] trickling back into it, besides being impracticable, [illegible] expensive and detrimental to house property.

8. The dry meter works with less pressure than [illegible] wet. Not only is a saving of gas thus effected, but [illegible] large cities where, during the winter season, dense f[illegible] occur, the low pressure in the mains during the [illegible] is not adequate to move the wet meters so as to su[illegible] enough of gas for the burners, and only small [illegible] flames can be obtained from them, but with the dry m[illegible] under all these circumstances there is sufficiency of [illegible] Thus interruptions to business are averted.

9. The action of the dry meter cannot, like th[illegible] the wet, be arrested by frost, causing total extincti[illegible] the lights. This makes the dry meter especially adv[illegible] tageous on railway lines, precluding, as it does, the [illegible] cessity of keeping up fires near the meter durin[illegible] severe and protracted frost. This applies with pec[illegible] force to countries where the cold is intense, and wh[illegible] the evil is attempted to be combated by putting [illegible] or glycerine into the meter.

10. Made of anti-corrosive metal, and not subject [illegible] the corrosive power of the chemical constituents of [illegible] gas and water, the dry meter is a much more d[illegible] durable instrument than the wet.

Coal gas, like water, has become a necessary of [illegible] It is so, more especially in large towns. Its superi[illegible] over all other materials for producing light is ackno[illegible] ledged, and the general and persistent demand of [illegible] public for gas at a lower price, and of higher illumin[illegible]

power, has induced gas companies again and again to lower its price; some to a point at which it is vain to expect profit so long as a loose system of measurement prevails, and one-fourth or one-fifth part of the whole quantity produced is allowed to go to waste, and is not paid for. Coal is becoming dearer; labour more expensive. And the question arises—How are dividends to be maintained or improved and the enormous capital sunk in gas properly protected? The coal cannot be made to produce more gas. Improvements and economy in its manufacture and distribution have nearly reached their limit. The pipes now are more solid than they used to be, while their increased size has enabled the companies to distribute their gas at a lower pressure. The joints, services, and fittings have been rendered much sounder and more perfect, so that, in gas-works which are properly managed, the actual loss by leakage is probably less than five per cent. And it is daily becoming more apparent that, if gas is to be produced at a remunerative rate, the present loose system of measurement must cease, and imperfect meters must give place to others which are reliable.

DISCUSSION.

Mr. ALEX. McIVOR said they were all indebted to Mr. Glover for his able paper, and he had no doubt scientific men would admit that he had done them service, as well as the proprietors and managers of gas works, in drawing attention to the subject of gas measurement. It had hitherto been a matter of great difficulty to find the means of accurately measuring gas, and this was only to be arrived at by the most delicate and carefully constructed apparatus. It must be admitted that great success had attended Mr. Glover's labours, for he had given a degree of accuracy and precision to the art of gas measuring which was previously unknown. The gasometers previously in use for testing meters were most imperfect and unsatisfactory, and presented a great many difficulties to gas managers. He had been shown by one manager a gasometer which he employed for this purpose, consisting simply of a bell suspended by a string over a pulley. It was painted green, and when pulled out of the water it was covered with wet. It was unnecessary to point out how imperfect such a measuring instrument as that must be. It was to be regretted that many gas managers were but slightly acquainted with the nature of the process they carried on. Until they got suitable instruments, however, it could in no case be expected that they would do the work properly. The perfection to which the art of gas making and distribution was now brought reflected great credit on the country, and the importance of the manufacture might be estimated by the fact that the consumption of gas in this kingdom amounted to £6,000,000 sterling annually.

Mr. CHANEY said, as an officer of the Exchequer, he begged to thank Mr. Glover for his valuable paper; he wished at the same time to remind the meeting how much they were indebted to Professor Airey, whose name had been so prominently mentioned in the paper, for his labours on this subject. He had devoted much of his valuable time, for a period of thirty years, to the restoration and preservation of our standard weights and measures. They were also indebted to Mr. George Lowe, the famous gas engineer, for the introduction of the decimal system in gas-measurement; and to Dr. Frankland, for his valuable investigations into the chemical and physical constitution of gas.

Mr. E. H. THORMAN regretted that no manufacturer of wet meters had risen in their defence. He could not quite agree with the sweeping condemnation that had been passed upon those instruments. It was a long time before he became a convert to dry meters. He knew that the public would now, if possible, have dry meters, but he thought the complaints against wet meters were more than experience and practice justified. He believed that the bad cases of error that had been brought forward were quite exceptional, and he regarded the wet meter as being very beautiful in its mechanical operation, and in every way worthy of the support of the gas companies.

Mr. C. F. T. YOUNG considered that the defects of the wet meter had not been dwelt upon too strongly, as they immediately became manifest on inspecting one which had been a long time in use. There was a constant antagonism going on between the materials—iron and brass—of which the mechanical portion of the instrument was formed, and the water in which it worked, and destruction of the parts necessarily ensued. When they reflected upon the fact that so small a difference of level in the water as a quarter of an inch very materially affected the discharge of the gas from the meter, it would be seen how important it was, both to the consumer and the manufacturer, that an instrument not liable to such imperfections should be employed. He had heard it asserted by persons well informed on the subject that wet meters had even been found to register incorrectly to the extent of 60 per cent. In the cases of 36 meters, taken indiscriminately, the register was found to be invariably incorrect, being in some cases against the consumer, and in others against the gas company. The dry meter certainly removed many of the objections which attached to the wet meter, and which were inherent to the principle on which it was constructed, and in his opinion the former was certainly much to be preferred.

Mr. F. W. HARTLEY said he stood there as an impartial individual, inasmuch as he was interested in the manufacture both of wet and dry meters. He admitted the truth of Mr. Glover's observations, but with some limitation. They were led to believe that the wet meter as now made was liable to grave and serious errors, both against the manufacturer and the consumer. He thought that could hardly be the case. The tilting of the meter in the way described by Mr. Glover could hardly be carried to any considerable extent without being detected by the inspecting officer of the company on the one hand or by the consumer on the other. The variation in the level of the water was permitted to the extent of 5 per cent.—2 per cent. against the consumer and 3 per cent. against the company. Protection was given to the consumer by a self-acting arrangement which shut off the supply as soon as the point was reached, which gave a register of 3 per cent. in favour of the company. He had inspected many hundreds of wet meters, but had never found such a variation as had been mentioned in the paper. As to the question of pressure, he denied that it had any effect upon the registration of the meter unless in connection with increased speed of the measuring wheel. This indeed he had tested, for some years ago he had occasion to make experiments on this point, and he found that working a meter at something like one-tenth of its speed, and trying it up to five times the proper speed, only effected a variation of two to three per cent. Evaporation was an objection which told most against the wet meter, and was one on which its opponents dwelt very strongly, and there certainly was inconvenience from this at times. It was stated that the combination of different metals introduced into wet meters tended to rapid destruction; but they had practical evidence of the long duration of these meters. If there was that violent galvanic action which had been referred to, the meters would long since have been destroyed, and would have gone out of use, because the public would have found them not durable. He therefore thought they were justified in assuming that the wet meter was not so disadvantageous as it had been represented to be. Mr. Glover was mistaken in supposing that all gas-holders were measured by the transferrer previous to the passing of the Sales of Gas Act. He knew that at the present time there were gas-holders that had been graduated by the exact weight of water previously to the passing of that act; and nothing could be more accurate. There was less difference between them and the Exchequer standards

than was permitted by the Act. He had nothing to say against the dry meter, but he believed that both that and the wet instrument were capable, if fairly used, of doing equal justice to the consumer and the company. If a wet meter were tilted in an unfair manner, they could not expect it to register correctly. It was as absurd to expect this as to place a clock on a shelf out of level and expect the pendulum to act.

Mr. DEFRIES, as a manufacturer of meters with an angular motion, justified that form of construction, on the ground that it did not carry condensation, but threw off the condensed matter, and deposited it at the base of the meter, where it could always be drawn off without disturbing the meter itself. The notion that the leather of the diaphragm was injuriously affected by the action of the gas upon it was, he said, entirely erroneous.

Mr. BISHOP, speaking only in the character of a gas consumer, expressed himself decidedly in favour of the dry meter.

The CHAIRMAN would now ask the meeting to accord their thanks to Mr. Glover for the very interesting paper he had read, and in doing so he would for a moment consider the position in which this question had been placed before them. He took exception to one or two remarks made in the paper:—First, as to the duty of the Government in matters of this kind; and in the next place, the statement that gasworks were not a nuisance to the neighbourhoods in which they were placed. As to the duty of the Government, he dissented entirely from the view that it was the function of Government to interfere with manufactures of any kind, whether gasmeters or anything else. It devolved upon the consumer to look after his own interests and to employ that meter which he believed to be most just, both to himself and to the gas company.

Mr. GLOVER explained that he had not advocated that the government should interfere with manufacture, but should merely give every facility for the production of gas, as conducing to the public welfare. He entirely concurred in the views expressed by the Chairman as to the importance of the non-interference of Government with trade or manufacture.

The CHAIRMAN, having quoted the paragraph of the paper which had prompted his remark, went on to say he did not hold it was the duty of the Government to interfere with manufactures in any way, and he did not know how they could "protect or encourage" without some sort of interference. He believed the real interests of commerce and of the progress of invention in this country were dependent upon the fullest and most unfettered employment of ingenuity and capital, and that Government protection or interference of any kind was an evil. As regarded gas works, he could not agree that it was desirable they should be placed in the centres of great towns. True, the recent accident which occurred at one of these works might have been prevented by proper precautions, but was there any accident which might not have been prevented by due and proper care? The question was, were not gas works subject to special kinds of accidents, and in the present day ought such elements of danger to be placed in the centres of large populations? He contended that the sooner such evils could be removed, without injustice to those who had invested their capital in them, the better. The paper opened the question as to which was the best instrument for measuring gas as it was delivered from the mains for the use of the consumer. He thought the relative merits of the wet and dry meter depended upon this—which of the two instruments was composed of the most durable materials. In the one case they had metallic mechanism working in water impregnated with ammonia, while the other meter was dependent upon the durability and elasticity of the leather diaphragm. It appeared to him, taking the facts as they stood on both sides—looking also at what had fallen from the speaker who was a manufacturer of both kinds of meters, and judging from experience, the evidence seemed certainly to be in favour of the dry meter, as opposed to the wet, which required a very large amount of attention to secure accurate working. Without condemning the wet meter, which was certainly a most ingenious instrument, he thought that when they looked at the admirable contrivances and beautiful workmanship which were introduced into the dry meters on the table before them, they must incline to the opinion that more permanent accuracy could be obtained by the latter instrument. He was sure they would feel that they were much indebted to Mr. Glover for the manner in which he had brought this subject under the notice of the Society, and he begged to propose a cordial vote of thanks to that gentleman for his paper.

The vote of thanks was unanimously passed.

Mr. GLOVER, in acknowledging the compliment, observed that he thought nothing had been said in the discussion to invalidate the statements made in his paper.

TRICHINIASIS.

Experiments have latterly been made (say Messrs. Travers) at the Veterinary School at Berlin, and formerly at Halle, on the subject of transplanting trichines from one animal to another. Four pigs were used for this experiment. A report was made upon the experiment, from which it appears certain that animals fed with meat diseased with trichines soon have the disease in their own bodies. The animals were fed daily upon trichine meat; they soon became ill, and three of the animals died within twenty-seven to thirty-seven days; the fourth recovered, but it was proved on removing some of the flesh that the animal was full of trichines. A sort of trichine insurance was consequently established, starting with the idea that the spread of the disease would receive a considerable check if the possessor of a diseased animal were to receive a compensation on the announcement of the animal being affected with trichines. The insurance only depended upon the goodwill of the people, as there were no funds at hand for the statistical calculations or for the requisite subscriptions, another plan was suggested as acceptable, viz., every pig in the country that was killed should be taxed 1 silver groschen [illegible] from the proceeds of which tax the possessors of trichine-diseased pigs should receive compensation. This would give a security that meat diseased in that way would not be further used for injurious purposes, as food for other animals, &c.

A writer in the *Boston* (U. S.) *Daily Advertiser* says:—"Allow me to state briefly that thorough cooking, pickling and smoking will destroy trichines in pork, and yet a person may get the disease by eating pork which has been submitted to one or all of these processes, if trichinous. A joint of meat may be boiled or roasted for a long time and still remain uncooked at the centre, as the flowing of the juices on cutting proves. A temperature sufficiently high to coagulate albumen, that is, to check the flow of these and to destroy the pink colour of the flesh, about 170 deg. F., will kill this as well as every other animal parasite, but it must penetrate throughout the mass. Pork thus cooked may be eaten with safety by those who do not object to meat [illegible] larded with entozoa. The same remarks apply to smoking and salting; the process must be continued until every portion of the muscular tissue has been penetrated by the agents employed. This so rarely happens, however, that it is much safer to add the precaution of thorough cooking. Nearly all the epidemics of trichinous disease in Germany have been caused by eating smoked sausages. With regard to the introduction of trichines amongst our New England swine, it is possible, if any of the conditions spoken of in the article published in your last supplement are fulfilled, that [illegible] presence here of a recently affected person or animal. Several cases of the disease have occurred in New York and the Western States, and swine infected through [illegible] and brought hither, might introduce it amongst us.

Publications Issued.

A DICTIONARY OF CHEMISTRY AND THE ALLIED BRANCHES OF OTHER SCIENCES, by Henry Watts, B.A., F.C.S., assisted by eminent contributors. *(Longmans.)* Part XXIV. of this work is just issued, and contains articles from "Potassium" to "Pyruvic Acid."

TRAITE DE LA GRAVURE A L'EAU FORTE. By Maxime Lalanne. 8vo. Paris.—Etching has of late become extremely popular in France, and M. Lalanne is one of the most able young artists in that style in Paris. This little work is a hand-book for the use of students and amateurs in etching, written with great clearness, and illustrated by plates by the author.

MANUEL PRATIQUE ET RAISONNE DE L'AMATEUR DE TABLEAUX. By Dr. Lachaise. 18mo. Paris.—A handbook for the connoisseur and picture-buyer, by an able writer on art, containing an immense amount of information, in a small space, on the history of art, on the characteristics of the various schools, and of the various masters, picture cleaning, and the bibliography of art.

Notes.

HORTICULTURE AT THE PARIS EXHIBITION.—A meeting of horticulturists and others took place on Monday, the 30th April, at South Kensington, in the conservatory of the Royal Horticultural Society. There were present, among others, Messrs. Veitch, Bull, Turner, Laing, Murray, Waterer, Beard, Budd, Blashfield, Lee; Dr. Hogg, Dr. Masters, &c. The invitation of the Imperial Commission for the Paris Exhibition of 1867, requesting British horticulturists to co-operate in an International Horticultural Exhibition, to be held in the Champ de Mars contemporaneously with the Exhibition of Arts and Manufactures, was explained and considered; and it was resolved to accept such invitation for a period not exceeding a fortnight, and to suggest the end of May or beginning of June for the same. It was also resolved that British horticulturists would be willing to co-operate with the British executive in exhibiting specimens of plants and flowers.

NEW MUSEUM AND LIBRARY FOR BORDEAUX. — The Maire of Bordeaux has laid before the Municipal Council of that city a proposal for the erection of a public museum and library, the cost of which is estimated at 2,400,000 francs (£96,000). The matter has been referred to the committees of Finance and Public Instruction.

HORSES AND CATTLE IN FRANCE.—The *Moniteur des Travaux Publics* gives the following statistics relative to horses and cattle in France:—Horses, 3,000,000; asses, 400,000; mules, 330,000; horned cattle, 10,200,000, of which 330,000 are bulls, 2,000,000 bullocks, 5,800,000 cows, and 2,100,000 heifers and steers; calves not more than twelve months old, 4,000,000; sheep and lambs, 35,000,000, of which 26,000,000 are merinos or half-bred marinos; goats and kids, 1,400,000; pigs more than twelve months old, 1,400,000; sucking and other young pigs, 3,900,000. France possesses about thirteen millions of acres of natural meadow land, about half of that quantity of cultivated meadow, and more than sixteen millions of acres of pasture and *landes*, or waste land.

Correspondence.

THE ANEROID INDICATOR.—SIR,—I shall feel obliged if you will allow me to say, in regard to Mr. R. F. C. Wilson's note in the last *Journal*, that I had on your table an instrument which, when completed, will give far larger indications than those of the aneroid indicator for the same amount of fire-damp, or carbonic acid gas. This instrument I showed to two gentlemen, who thought well of it because it is not affected by alterations of level, pressure of the atmosphere, &c., and is, indeed, purely an indicator. I took some pains to explain to Mr. Wilson that the aneroid indicator is nothing more than an aneroid, and as such is a useful instrument, but that there are a few trifling additions besides the porous tile by which at will it becomes an indicator and ceases to be a barometer.—I am, &c., GEORGE F. ANSELL.

Royal Mint, May 1, 1866.

MEETINGS FOR THE ENSUING WEEK.

MON......Farmers' Club, 5½. Discussion on "Increasing the Supply of Animal Food."
Odontological, 8.
Society of Engineers, 7. Mr. P. Jensen, "On the Incrustation of Marine Boilers."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8. Annual Meeting.
Asiatic, 3.
R. United Service Inst., 8½. 1. Chevalier Angelini, "On the means of preventing Sore Back and Galling amongst Horses, Mules, &c., in Military and Transport Services." 2. Captain J. H. Selwyn, R.N., "A new principle of Rifle Projectile for Smooth-bore Artillery, calculated to obviate the necessity for Rifling."

TUES. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. G. R. Burnell, "On the Water Supply of the City of Paris."
Zoological, 8½.
Syro-Egyptian, 7½. Rev. J. Mills, "Discussion on the Dome of the Rock and the Church of the Holy Sepulchre."
Photographic, 8.
Ethnological, 8. 1. Mr. John Crawfurd, "On the Migration of Cultivated Plants in reference to Ethnology." 2. Dr. John Shortt, "On the Fishermen of Southern India."
Royal Inst., 3. Prof. Ansted, "On the Application of Physical Geography and Geology to the Fine Arts."

WED. ...Society of Arts, 8. Colonel Wilford, "On the Progress of Fire-arms for Military Purposes to their Present State."
Geological, 8. 1. "Sir Philip de M. G. Egerton, Bart., "On a new species of *Acanthodes* from the Coal-shales of Longton." 2. Mr. Harry Seeley, "On the Gravels and Drift of the Fenland." 3. Prof. R. Harkness and Mr. H. Nicholson, "Additional Observations on the Geology of the Lake-country." 4. Prof. R. Harkness and Mr. H. Nicholson, "On the Lower Silurian Rocks of the Isle of Man."
Graphic, 8.
Microscopical, 8. 1. Mr. Jas. Smith, "On a form of Rotating Leaf-holder." 2. Dr. Greville, "New and rare Diatoms."
Literary Fund, 3.
Archæological Assoc., 4½. Annual Meeting.

THUR....Antiquaries, 8½.
Royal Inst., 3. Prof. Huxley, "On Ethnology."

FRI ......Astronomical, 8.
Royal Inst., 8. Prof. Ansted, "On the Mud Volcanoes of the Crimea."
R. United Service Inst., 3. Commander R. A. E. Scott, R.N., "Modern Carriages for Heavy Naval Ordnance."

SAT ......Royal Inst., 3. Prof. Huxley, "On Ethnology."
R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 20th April, 1866.

112. Bill—Harbour Loans.
15. (340 to 343) Railway and Canal, &c., Bills—Board of Trade Reports.
96. Army (Manufacturing Establishments)—Return.

Delivered on 21st April, 1866.

110. Bills—Tithe Rent Charge (Ireland).
113. „ Turnpike Roads.
115. „ Glebe Lands (Scotland).
175. Metropolitan Workhouses—Return.
187. British Museum—Accounts.

Delivered on 23rd April, 1866.

116. Bills—Contagious Diseases (amended).
117. „ Drainage and Improvement of Lands (Ireland).
15. (344) Railway and Canal, &c., Bills—Board of Trade Report.
123. Army—Statement of Savings and Deficiencies.
193. Diseased Cattle—Order in Council.

Delivered on 24th April, 1866.

95. Bills—Drainage Maintenance (Ireland).
111. „ Grand Juries Presentment (Ireland) (amended).
156. Ships "Scorpion" and "Wyvern;" Ship "Scorpion"—Return.
157. Navy (The "Amazon")—Return.
179. Militia Regiments—Return.
186. Metropolitan Local Government, &c.—First Report.
Public General Acts—Caps. 14 and 15.

Delivered on 25th April, 1866.

119. Bill—Parliamentary Oaths (Lords Amendment).
87. Navy (Turret Ships)—Return.
192. National Portrait Gallery—Ninth Report of Trustees.
195. East India (Educational)—Return.
197. Metropolis Turnpike Roads—Return.
199. Dundee Fraternity of Masters and Seamen—Abstract of Return.
200. Contagious Diseases Bill—Special Report.

SESSION 1865.

446. Import and Export Duties—Return.

Delivered on 26th April, 1866.

191. Reigate Election—Minutes of Evidence.
209. Cork and Youghal Railway Bill—Lords Report.

Delivered on 27th April, 1866.

120. Bill—Exchequer and Audit Departments (amended on Re-commitment.
69. (II.) Railway and Canal Bills—Third Report.
154. Criminals (Scotland)—Abstract of Tables.
189. Brewers, &c.—Accounts.
194. Foreign Sugar—Account.
208. Barony of Farney—Return.

Delivered on 28th April, 1866.

106. Bills—Bankruptcy Law Amendment, &c.
123. " Marriages (Ireland) (No. 2).
144. Increase and Diminution (Public Offices)—Abstract of Accounts.
205. West African Mail Contract—Correspondence.
214. Cattle Plague—Memorial.

SESSION 1865.

442. (A. X.) Poor Rates and Pauperism (February, 1865 and 1866)—Return (A.)

Delivered on 30th April, 1866.

125. Bills—Land Drainage Supplemental.
126. " Inclosure.
68. (III.) Trade and Navigation—Accounts (31st March, 1866).

Patents.

From Commissioners of Patents' Journal, April 27th.

GRANTS OF PROVISIONAL PROTECTION.

Achromatic object glasses—929—W. Wray.
Aerated liquids, drawing off—1035—W. Clark.
Aniline, obtaining colouring matters from—938—A. L. M. Guétat.
Aniline red, obtaining—968—A. A. Jaeger.
Aniline yellow, obtaining—904—A. A. Jaeger.
Animal charcoal, reburning—952—J. Robey.
Animal charcoal, treating—1005—G. Gordon.
Animals, troughs for feeding—972—G. Rumbelow.
Anti-friction bearings—989—A. B. de Gablenz.
Articles, fastenings for—1011—W. Clark.
Artificial tea, making—690—H. F. Davis.
Bituminous matters—871—J. Buckingham.
Blast furnaces, utilizing gases from—1023—J. Sparrow and S. Poole.
Bridges, foundations of—1022—W. Robotham.
Bung-turning lathe—1025—J. Kennan.
Carding machines, feeding fibres to—1000—W. Clissold.
Carpets, &c.—994—W. E. Newton.
Cast steel, casting articles of—1001—A. V. Newton.
Checks, numbering—988—J. Fraser.
Cotton waste, recovering—1010—F. L. Bauwens.
Cramps—918—J. F. C. Carle.
Crinolines—1024—W. Clark.
Cylindrical bodies—901—W. Deakin and J. B. Johnson.
De-sulphuration—1017—G. Davies.
Distilling—992—J. Young.
Double fabrics—994—J. Patterson.
Dynamometric apparatus—924—W. Pendry.
Elastic fabrics—986—W. Cole.
Electric telegraphs—932—S. M. Martin, S. A. and F. H. Varley.
Fats and oils, pancreatic emulsions of—944—J. Schweitzer.
Fibrous substances, preparing, &c.—1031—G. A. Ermen.
Fire-arms, breech-loading—789—J. H. Johnson.
Fire-arms, breech-loading—916—G. Starreck.
Fire-arms, breech-loading—1033—J. Crofts.
Fire-arms, revolving—997—E. T. Hughes.
Fragile articles, receptacles for—1027—S. W. Silver and A. Hayward.
Furnaces—1029—W. Young.
Gloves, fastening for—998—C. E. Brooman.
Grain and raw spirit, treating—985—W. R. Taylor and G. Hewett.
Gun cotton, preparing and treating—953—E. C. Prentice.
Houses, heating—1003—G. Davies.
Hydrostatic presses—958—A. A. Hely and J. Marshall.
Juices or saps of trees, solidifying—934—E. P. H. Vaughan.
Latitude, &c., ascertaining—946—J. M. Rowan and A. Morton.
Leather-splitting machines—926—E. T. Hughes.
Liquids, ejecting and applying—906—H. J. F. H. Foveaux.
Liquids, measuring—908—J. and J. Parkes.
Magic photography—987—W. Grune.
Metal bolts and rods—879—W. Boggett.
Motive power, obtaining—752—F. G. A. Horstmann.
Motive power, obtaining—804—G. Zanni.
Oil, volatile—1021—E. Lichtenstadt.
Pianofortes, double-action—950—G. Haseltine.
Pipes, &c., moulding—1007—J. Foster and J. Hollinrake.
Portable dark chambers—980—E. Cox.
Railway carriages, breaks for—986—J. Richardson and J. Tait.
Receptacles, fastenings for—1013—W. Rawlings and W. Rest.
Rocks, boring—974—S. Richards.
Rolling and clod crushing—266—J. Spencer.
Safes—552—J. C. and H. J. Haddan.
Safes—930—G. Hindshaw.
Safes—954—J. Maddocks and W. Dunn.
Sails, reefing and furling—970—G. Allix.
Sewage, utilizing—1026—G. W. Shinner.
Ships—856—T. E. Symonds.
Shuttles—928—A. Bullough.
Smoky chimneys, preventing—991—W. Cooke.
Soda waste, separating sulphur from—1016—P. W. Hofmann.
Steam engine, registering steam in the cylinders, of—923—G. White.
Steam pumps—853—W. Clark.
Steering indicators—978—C. J. Viehoff and J. A. Matthiessen.
Structures, roofs of—962—W. Howitt.
Substances, breaking—1028—J. Frost.
Substances, preventing the putrefaction of—921—J. Davis.
Sugar, treating—960—J. H. Johnson.
Sulphuric acid—1002—E. K. Muspratt.
Surfaces, engraving—1019—R. Leake, W. Shields, and J. Beckett.
Train intercommunication—966—S. M. Martin and S. A. Varley.
Vessels, paddle-wheels for propelling—728—W. E. Newton.
Weaving, looms for—912—W. R. Lake.
Weaving, looms for—942—W. and J. Chew, and W. J. Lucas.
Weaving, looms for—1004—J. L. Davies.
Wheel-work, fly for regulating—870—P. Stieffel.
Yarn, &c., dressing and polishing—936—W. Hill and T. Whitehead.
Yarns, &c., sizing or dressing—940—R. Dewthurst.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Aquatic fireworks—1141—F. Barnett.
Looped fabrics—1114—F. E. Woller.
Sheet iron—1121—G. Haseltine.

PATENTS SEALED.

2786. H. Larkin.	2835. H. Bessemer.
2791. R. D. Dwyer.	2836. F. Tolhausen.
2792. A. Braquenié.	2838. J. B. Elkington.
2795. W. Deakin & J. B. Johnson.	2839. R. Smith, jun.
2802. T. F. Cashin and J. F. Allender.	2849. P. B. O'Neill.
2803. R. Cassels and T. Morton.	2857. W. T. Hamilton.
2805. C. Emmet.	2902. C. W. Jones.
2806. M. Bayliss.	2911. W. T. Hamilton.
2809. E. A. Phillips.	2976. T. B. Heathorn and J. I. G. Wells.
2810. J. Sellars.	3056. H. A. Bonneville.
2813. A. Boissonneau.	260. W. H. Barlow.
2820. J. Curtis.	350. W. Spencer and T. B. Cutts.
2821. H. Jones.	449. C. Gilpin.
2825. L. Schad.	510. M. J. L.-y-Munoz.
2826. E. Rushton.	

From Commissioners of Patents' Journal, May 1st.

PATENTS SEALED.

2827. W. E. Dobson.	2898. E. J. Davis.
2837. J. J. McComb.	2909. W. Reid.
2840. G. Wilson and W. K. Hydes.	2912. P. Ellis.
2845. H. Radcliffe.	2936. H. Clifton.
2846. A. Jemmett.	3009. T. Redwood.
2848. W. Brett.	3033. J. H. Johnson.
2850. J. King and A. Watson.	3040. W. E. Newton.
2852. W. Gardner.	3046. W. E. Gedge.
2859. A. Paraf.	3141. W. E. Newton.
2860. R. C. Mansell.	3143. N. Salamon and W. J. L. Davids.
2862. W. Hebdon.	65. J. H. Johnson.
2865. W. Esplen and J. Clarke.	236. G. T. Bousfield.
2868. H. Bateman.	258. J. M. A. Montclar.
2873. F. G. Bennett.	261. G. T. Bousfield.
2880. J. H. Johnson.	330. G. Gwynne.
2886. W. D. Allen.	353. W. Renney.
2888. T. Berrens.	763. J. F. Belleville.
2892. T. Redwood.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1033. J. P. and E. B. Nunn.	1053. F. Bennett.
1079. E. and F. A. Leigh.	1056. W. Hudson and C. Catlow.
306. T. L. Jacobs.	1061. S. Crabtree.
1020. R. Lavender.	1098. W. G. Craig.
1029. R. Lavender.	1247. J. Beaumont.
1029. L. de Bremski.	1092. C. P. Stewart & J. Kershaw.
1035. L. A. J. Brunet.	1118. E. Cheeshire.
1047. H. E. Carchon and E. F. Raybaud.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1111. L. R. Blake.	1082. W. Winstanley and J. Kelly.
1051. J. H. Johnson.	1065. C. Randolph and J. Elder.
1109. W. Sellers.	1075. W. McL. Cranston.
1059. J. H. Johnson.	

Journal of the Society of Arts.

FRIDAY, MAY 11, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'Clock:—

MAY 16.—*Derby Day*—No Meeting.
MAY 23.—"On Granite Working." By GEORGE W. MUIR, Esq.

CENTRAL HALL OF ARTS AND SCIENCES.

The arrangements for erecting a Great Central Hall of Arts and Sciences at Kensington, on the ground purchased out of the profits of the Exhibition of 1851, having been carried so far as to secure the erection of that building, it has been thought desirable that members of the Society of Arts should be put in possession of full information on the subject, in case they should desire to invest in the property, before the whole of the available seats are disposed of. A copy of the prospectus was, therefore, forwarded to each member with a former number of the *Journal*, and the Secretary of the Society will afford any further information on the subject if applied to. A model of the Hall is now on view at the Society's house.

Proceedings of the Society.

MEMORIALS OF EMINENT MEN.

A Committee has been appointed by the Council to consider and report how the Society may promote the erection of statues or other memorials of persons eminent in arts, manufactures, and commerce. The following gentlemen have been requested to serve on this Committee:—

Mr. William Hawes, Chairman of the Council, Earl Stanhope, The Right Hon. W. Cowper, M.P., Lord Henry Lennox, M.P., Mr. H. B. Bodkin (Assistant-Judge), Messrs. Harry Chester, H. Cole, C.B., S. Redgrave, C. Wren Hoskyns, G. Hamilton, M.P., John Bruce, Captain Donelly, R.E., A. J. B. Beresford Hope, M.P., J. J. Bond, R. Fisher, Lieut.-Col. Scott, R.E., H. Vaughan, G. E. Street, P. C. Hardwick, Sir John Thwaites, J. W. Bazalgette, George Vulliamy, and G. C. T. Bartley.

The Committee met on Monday, the 7th inst., and took into consideration the following suggestions:—

MEMORANDA ON THE PROPOSAL TO PLACE LABELS ON HOUSES IN THE METROPOLIS KNOWN TO HAVE BEEN INHABITED BY CELEBRATED PERSONS. SUBMITTED TO THE COMMITTEE OF THE SOCIETY OF ARTS.

In looking over some papers relative to the subject of labelling houses in the metropolis which have been inhabited by celebrated persons, I find the following remark, by Samuel Rogers, in a note to one of his poems, and it appears apt and appropriate to the subject:—

"There is a custom on the Continent, well worthy of notice. In Boulogne we read, as we ramble through it, 'Ici est mort l'auteur de Gil Blas;' in Rouen, 'Ici est né Pierre Corneille;' in Geneva, 'Ici est né Jean Jacques Rousseau; and in Dijon there is the 'Maison Bossuet;' in Paris the 'Quai Voltaire.' Very rare are such memorials among us, and yet wherever we met with them, in whatever country they were, or of whatever age, we should surely say that they were evidences of refinement and sensibility in the people." At Cogoletto also, I remember a similar label over a house where some say that Christopher Columbus was born. It is devoid of any pretensions to artistic beauty, yet is a point of great attraction to the village, and all visitors along the Corniche road stop and read its Latin inscription; probably few would notice the house or the fact connected with it if to do so required hunting in a 'Murray's Guide.' Similar labels abound in Germany, especially at Hanover, also at Munich, and elsewhere.

It is indeed remarkable that this custom has not long ere this been prevalent in London, where so many historic houses still remain, but there can be little doubt that if once started the public would be interested in the matter, and that it would receive very general support and assistance.

The chief difficulty would be in the expense of erecting the first few labels, in order to start the scheme, and if this were done by an influential society, such as the Society of Arts, it would, I venture to think, rapidly be followed by many persons, living in or owning houses historically interesting, who would undertake to note the fact at their own expense by some ornamental label.

To further this object, I have prepared the accompanying index of names of noteworthy persons known to have resided in the houses mentioned; in some cases having been born in them, in others having died in them, and in others having merely lived in them for a portion of their existence. As far as possible houses which have been destroyed of late years have been excluded, though it is probable or rather certain that even in the last twelvemonths several interesting relics have been removed by the numerous metropolitan improvements. The list is about half finished, but I would willingly have it made as complete as possible, though I think enough is done to give some idea of the amount of interesting matter which remains, and which these labels would make known. To travellers up and down in omnibuses, &c., they might sometimes prove an agreeable and instructive mode of beguiling a somewhat dull and not very rapid progress through the streets.

After thinking over the details of the scheme, I would venture to make the following remarks:—

In selecting the first few houses to be labelled, it would appear advisable to take, as far as possible, those which are situated in the principal thoroughfares.

The nature of the labels themselves is of course a matter of taste, and no doubt would be settled by those who put them up, having regard not only to the appearance, but also to the cost. At the same time it appears to me that they should differ as far as is possible from monumental or funeral tablets, as the public would certainly not like or tolerate the chief thoroughfares being converted into streets of tombs of a cheap and modern style. The same remark would apply to any attempt which might be made in this advertising age to utilize the memory of a former inhabitant for commercial advantages; this should be as much as possible avoided.

Concerning the make of the labels it would seem that imperishability and ease in cleaning from deposits of soot, &c., form essential elements, as also, to a certain extent, moderate cheapness; I cannot think of anything that better meets these requirements, being at the same time of a most ornamental character, than the reviving and most ancient mode of wall decoration, viz., mosaic. In

many ways this might be used; either a plain polished marble or red granite slab, with an ornamental border of mosaic, or perhaps mosaic letters and a gold background with geometric border of the same material, but these details circumstances would settle, as the taste of the erector might prefer.

The wording of the inscription on the label is a matter of importance, and it appears to me that all terms of praise, or otherwise, should be omitted, and merely the plain statement of the facts given, consisting of names—for what celebrated—and dates of birth and death. The whole to be as concise and distinct as possible, to enable all who run to read.

The height of the labels on the walls must necessarily be settled by circumstances, but should generally be, I think, about 12 or 14 feet from the ground, according to the height of the ground floor.

A good effect, springing from such a custom as this, may be a tendency to increase the public estimation for places which have been the abodes of men who have made England what it is; and thus some of the old haunts of London, teeming with historic interest, may be preserved from the ruthless hands of modern destroyers and improvers.

Should these remarks, and the papers I enclose, be of any use in carrying out the scheme, I should be glad to complete them, and, if desired, to carry out the erection of any tablets which it may be determined to put in hand.

George C. T. Bartley.

13th April, 1866.

141, New Bond-street:—

Viscount Nelson
Lived here in 1797.
B. 1758. D. 1805.

7, Craven-street, Strand:—

Benjamin Franklin
Lived here.
Printer, Philosopher, and Statesman.
B. 1706. D. 1790.

Artillery-walk, Bunhill-fields:—

John Milton
Finished "Paradise Lost" here.
Author of
"Paradise Lost,"
"Paradise Regained,"
"L'Allegro e il Penseroso,"
&c., &c.
B. 1608. D. 1674.

24, Holles-street, Cavendish-square:—

Lord Byron
Born here in
1788.
Author of
"Childe Harold,"
"Eastern Tales," &c., &c.
B. 1788. D. in Greece 1824.

Rawthmell's Coffee-house, Henrietta-street, Strand:—

The Society of Arts, Manufactures,
and
Commerce,
Was established and held its first meeting
Here on the 22nd March, 1754,
Viscount Folkestone, President.

8, Bolt-court, Fleet-street:—

Dr. S. Johnson
Lived and died here.
Author of
The English Dictionary,
&c., &c., &c.
B. 1709. D. 1784.

57, Brook-street, Grosvenor-square:—

Handel
Lived here.
Composer of
Music.
B. 1684. D. 1759.

5, The Terrace, Adelphi:—

David Garrick
Lived and died here.
Actor.
B. 1716. D. 1779.

14, Hertford-street, May-fair:—

Dr. Jenner
Lived here.
The discoverer of Vaccination.
B. 1749. D. 1823.

28, Lower Grosvenor-street:—

Sir Humphrey Davy, F.R.S.,
Lived here.
Chemist, and Natural Philosopher.
Inventor of the Miner's Safety Lamp.
B. 1779. D. 1829.

Inner Temple-lane, Fleet-street, in what are call Farrar's-buildings:—

James Boswell
Lived here.
Author of the "Life of
Dr. Johnson."
B. 1740. D. 1795.

Charles-street, St. James's-square:—

Edmund Burke
Lived here.
Author, Statesman, and Orator.
B. 1730. D. 1797.

45, Berkeley-square:—

Lord Clive,
Died here.
Warrior and Statesman,
Governor-General of India.
B. 1725. D. 1774.

37, Bury-street, St. James's:—

George Crabbe
Lived here.
Poet.
Author of "The Library,"
"The Village," "The Borough," &c.
B. 1754. D. 1832.

Brooke-street, Holborn:—

Chatterton
Lived and died here.
Poet.
B. 1752. D. 1770.

Bedford-row, Bloomsbury:—

Mrs. Elizabeth Cromwell
Lived here in 1731.
Daughter of the Protector.

The Committee resolved that the Chairman of Coun should be asked to take the chairmanship of the Com mittee, and that Mr. G. C. T. Bartley should act convener.

The Committee recommended that experiments w various descriptions of tablets be made, and that desig be produced for that purpose.

That on such tablets should be inscribed concise inf mation relative to the individual or the fact comme

rated by such tablet, and that the name of the Society of Arts should be appended thereto.

The Committee further recommended that the tablets should not be limited to persons eminent in arts, manufactures, and commerce, but should include places and persons connected with historical events, such for instance as site of the residence of Lady Abingdon, where Abingdon-street now stands, who was known as the writer of the letter to Lord Monteagle in reference to the Gunpowder Plot, also the spot where Caxton worked his first press in Westminster, and the like.

Mr. Bartley laid before the Committee notes of suggestions in reference to names of persons and places suitable for record, and the Committee requested Mr. Bartley to continue them with a view to their being published in the Society's *Journal*.

Twenty-second Ordinary Meeting.

Wednesday, May 9th, 1866; Major-General Vincent Eyre in the chair.

The following candidates were balloted for, and duly elected members of the Society:—

Carrick, Robert, Chemical Works, Methill, Leven, N.B.
Taylor, Charles W., 167, Great Dover-street, S.E.
Whight, George, Gipping Works, Ipswich.

The Paper read was—

ON THE PROGRESS OF FIRE-ARMS FOR MILITARY PURPOSES TO THEIR PRESENT STATE.

By Colonel E. C. Wilford,

Late Assistant-Commandant and Chief Inspector at the Hythe School of Musketry.

Infantry, having both offensive and defensive powers, are of higher relative value than either artillery or cavalry; they are numerically stronger, and can perform more varied duties. The requirements of a military small-arm are, accuracy at long ranges, celerity of fire at short, strength combined with lightness, sufficient length when the bayonet is fixed to be used as a pike, penetrating power for the projectile, minimum of recoil, and capability of being easily cleaned. It should be on the principle of "interchange." The barrel may be considered as a machine in which the propelling force is generated; the gas evolved from gunpowder may be regarded as the motive power, and the projectile and bayonet as the destroying agents.

Small-arms were not generally known in this country until the middle of the fifteenth century, and the first were called "hand-gonnes." The hand-gun was of very rude construction; it consisted of an iron or brass tube, with a touch-hole on the top; it had a straight wooden stock, about 2 ft. 6 in. long, and when fired the end of the stock was placed under the right armpit; the match was of slack-spun cotton or hemp boiled in a strong solution of saltpetre or lees of wine, and was ignited with the right hand. When used on horseback it was supported by a forked rest, attached to the pommel of the saddle. Some were breech-loaders, and these were of large calibre, and fired iron balls. The earliest improvements were suggested by the cross-bow. The cock was fixed to hold the match, and was brought down to priming by a trigger, hence it was called a "matchlock," and this name was afterwards applied to the whole weapon. From its simplicity of construction, this mode of ignition is still retained by many semi-civilized nations. A pan to hold the priming was placed on one side, with a sliding cover. The next step towards improvement was to shorten and widen the butt, so that it could be placed against the right breast; subsequently the stock was bent and flattened, and the butt pressed into the hollow of the right shoulder, and thus better aim could be taken; then the barrel was lengthened, the calibre reduced, and the weapon was fired off a rest; the weight of this arm was from 12 lbs. to 18 lbs., and it was called a harquebuss.

The next stage of progress was the invention of the "wheel-lock" at Nuremburg, in 1517. It consisted of a steel wheel, rasped, protruding into the priming, and a cock, into which was fixed a piece of pyrites; the wheel was fitted on an axle, to which a spring was connected by a chain swivel. The cock was moved by hand to the wheel on which the pyrites rested; the lock was wound up by a key, and on pressing the trigger, the wheel rotated, sparks were emitted, and the priming ignited, hence came the name of "fire-lock." Its failure was owing to the intricacy of its construction, the softness of the pyrites, and the great expense of using it, and it was employed by cavalry only, the matchlock retaining its position with infantry.

Fire-arms had gained such ground by the reign of Edward VI., that archery began to decline rapidly, although not without much clamour, the bow being thought superior as a weapon, except in this respect, that the harquebuss had power to penetrate armour. Queen Elizabeth ordered bows to be replaced by "muskettes" in 1596; they nevertheless lingered in partial use until 1664, when they were employed for the last time by the Marquis of Montrose against the Scots.

The musket, supposed to have been introduced from Spain, was heavier than the harquebuss and of larger bore, with bullets ten to the lb. Another weapon, called the caliver, was of uniform bore and smaller than the musket, it was also lighter and fired without a rest. In 1621 the barrel of the musket was four feet long, and the bullets were twelve to the lb.

In 1629 hair-triggers were applied to the wheel lock, and called "tricket" locks; they are too delicate and dangerous for military purposes, and therefore never became general. The snap-haunce, a much improved lock, was invented in Germany towards the end of Queen Elizabeth's reign. A piece of furrowed steel which moved on a pivot was substituted for the wheel, the cock had flint instead of pyrites, and the pan was provided with a moveable cover; the steel or hammer was bent down over the pan, and on the trigger being pressed the cock struck the hammer, sparks were elicited, and the priming ignited. The position of the cock was on the far side of the pan, and fell towards the firer.

The modern flint-lock, a great advance upon the snap-haunce, was invented in France about 1635. It differed from the latter by dispensing with the pan cover, a hammer seat being substituted, and the cock placed between the firer and the pan, and so as to fall from the firer. So imperfect were all previous locks that two modes of ignition were frequently available.

In 1646 so inaccurate was the musket that the Earl of Albemarle suggested that six fowling-pieces be given to each company, with orders to fire at officers only. In 1677 Lord Orrery writes, "I wish our companies consisted of fewer shots and more pikes." In 1766 a General Loyd recommends "the abandonment of the system of arming the whole of the infantry with fire-arms, as not more than one shot in four hundred takes effect." Musket rests fell into disuse during the time of Cromwell—1649 to 1660. Iron ramrods were introduced about 1741. From the introduction of the flint-lock in 1635, there were no improvements for 200 years.

In 1800 the weight of the musket was 11 lbs. 4oz.; ditto of bayonet, 1 lb. 2oz.; length of barrel, 3 ft. 3in.: the bullets were 14½ to the lb. For priming, originally a finer grain powder was put into the pan from a flask, afterwards the touch-hole was made large enough to be a self-primer, latterly the top of the cartridge was bitten off and the pan filled before loading. The objections to the flint-lock were that the powder got wet, and consequently there were frequent missfires.

In 1807, the Rev. Mr. Forsyth invented a fulminating powder, which consisted of chlorate of potash, sulphur, and charcoal; it was, however, found too corrosive, and

was subsequently improved—it eventuated in the introduction of the percussion-cap, in 1842. Shooting then became more accurate and rapid, and the missfires were reduced to one in twenty-six. At the same date the charge was reduced from 6 drachms to 4½ drachms, thus lessening recoil, while a block sight was fixed for shooting at distances of 150 yards. Notwithstanding all these improvements, however, at the end of 400 years the English soldier carried the worst musket in Europe. It had, 1st, the least accuracy; 2nd, the shortest range; 3rd, the greatest recoil; 4th, it was the heaviest weapon; 5th, it was the shortest weapon; 6th, it had the largest bore; 7th, it required a double charge of powder; and, 8th, it was the most expensive to use.

With regard to the bayonet, from the earliest ages some of the infantry were armed with pikes, and pikemen covered the archer, and afterwards fulfilled the same duty towards the musketeer as a protection against cavalry. Both carried a short sword; the musket rest, either with a spike on one prong or with one which flew out on touching a spring, was also used; eventually a short dagger was (1st) stuck into the muzzle, and (2nd) attached to the side; this ultimately led to the present bayonet, which is so arranged that when it is fixed the gun can still be fired. It was introduced subsequently to 1689, and is a French invention. Pikes were abolished in France in 1703.

Gunpowder still continues our motive power, and is made of the same ingredients as on its first discovery—saltpetre, charcoal, and sulphur—with vast improvements in the manner of purifying them, and in their mechanical combination and proportions. All this has, doubtless, tended to improve the construction of guns, and increase their effect. Air and steam have been tried without practical results, and gun-cotton is now in progress of experiment. Great propulsive, and mild explosive force, uniformity of effect, entire combustion, non-liability to the influences of climate, facility of transport, and keeping powers—are the leading *desiderata* for the propelling material for fire-arms.

Short arrows, balls of stone, iron, and lead, have been fired out of muskets, but for many years spherical balls of lead only were used.

In reference to the imperfections of the musket, I will quote from a lecture on the rifle, delivered by me at the United Service Institution:—

"The shooting powers of the English musket, pattern 1842, were tested in a series of experiments undertaken at Chatham in 1846, under Lieut.-Colonel M'Kerlie, Royal Engineers, by order of the Government, whose clear and able report concludes as follows:—'It appears that musketry fire should never be opened beyond 150 yards, and certainly not exceeding 200 yards. At this distance (200 yards) half the shots missed a target eleven feet six inches, and at 150 yards a very large proportion also missed. At 75 and 100 every shot struck the target only two feet wide, and had the deviation increased simply as the distance, every shot ought to have struck the target six feet wide at 200 yards; instead of this, however, some were observed to pass several yards to the right and left, some to fall 30 yards short, and others to pass as much beyond, and this deviation increased in a still greater degree, as the range increased. It is only then under peculiar circumstances, such as when it may be desirable to bring fire upon field artillery, when there are no other means of replying to it, that it ought ever to be thought of using the musket at such distances as 400 yards.' It is an undoubted truth, that the comparative worthlessness of infantry fire was deplored by intelligent officers of all armies. The following extract from 'Decker's Three Arms,' translated by Major Inigo Jones, Prince Albert's Hussars' (page 14) will show how lowly it was estimated:—'The fire of the line decides nothing, and is generally kept up to employ the men in the front line, till other troops are brought into play.' How significant! Had the word 'also' been introduced, it would have read thus, 'till other troops are also brought into play.' Mr. Decker adds, 'To make the fire of the line effective, it ought not to commence further than 30 yards at the outside, when only one shot in ten will hit on an average. It is even now and then employed to keep young or bad soldiers employed, and to blunt the idea of danger. The reason is pitiful; however, a soldier remains with his feelings as a man, but forgets his human weakness in the heat of battle. Suwarrow also, knowing the inefficiency of line fire, used to tell his soldiers that three cartridges were enough for each; with one he was to shoot an enemy 30 yards off; the second man he was to bayonet; and all the rest would run away.'

"Hence it seems to be admitted that beyond 80 yards it lost all certainty of hitting a single man; at 200 yards it was uncertain even at large bodies; at 300 yards you might shoot all day at a target eighteen feet square, and never strike it once; so that a man would be in perfect security although fired at from sunrise to sunset, at even a shorter distance than 300 yards provided the firer made a faithful promise always to aim at him; and should he take the liberty of aiming 50 yards right or left, above or below, I should then be sorry to answer for the possible consequences. * * *

"Admiral Sir Thomas Maitland informed me of an experiment on a large scale, by order, and in presence of the late Emperor Nicholas of Russia. There were 10,000 infantry drawn up in regiments, three ranks deep, and a target, six feet in height, and the width of a regiment, was placed opposite to each. They commenced firing at 300 yards, but the targets were not hit; at 200 yards some little business was done; but not until they marched up to 100 yards, was the execution worth speaking of."

The rifle was very partially introduced into our army in 1794, and has now come into general use. I need [illegible] inform you that the object of rifling is to give rotation to the projectile round its axis of progression, so as to insure a regular and steady flight. On this subject I quote from the text book used by officers in the School of Musketry:—

"Various plans have been proposed for furnishing the projectile itself with vanes, wings, grooves, or other configurations intended to give it rotation during its passage through the air; but the only practical method hitherto adopted has been to make the barrel of a fire-arm of such a shape in its interior, that the projectile, while being propelled from the breech to the muzzle, will receive a rotatory combined with a forward motion.

"The systems of rifling in general use may be classed under three headings.

"First—*The Grooved Cylinder.*—Rifling by grooves is the system that has been generally adopted by gunmakers of all countries and in all periods since the introduction of rifled arms, and is that which is adopted at the Royal Small Arms factory, Enfield, in the manufacture of rifles for the army and navy.

"Second—*The Elliptical or Oval Bore.*—The distinctive character of this system, as adopted by Mr. Lancaster, is that the barrel is cut in its interior in the form of an ellipse, the difference between the major and minor axes being ·012. The barrel being a smooth bore is easily cleaned; there are no recesses for the collection of fouling, and the bullet does not act upon the air with any sharp edges.

"Third—*The Polygonal System.*—This has been adopted by Mr. Whitworth in the construction of his rifle, the bore of which is hexagonal and measures across the flats, *i.e.*, the minor diameter, ·451, and across the angles, the major diameter, ·503 inch; and by Mr. W[illegible] Richards in his breech-loader, the bore of which is octagonal; also by Mr. Henry, of Edinburgh, the bore of whose rifle is heptagonal, with a rib in each of its angles."

It must be borne in mind that the form of projectile employed is a matter of the greatest importance. On this point the text book says:—

"The velocity (initial) of a round shot is greater than that of an elongated one of the same diameter, taken transversely. Suppose the transverse sections of two shot, one spherical the other elongated, to be the same, and also the resistance, then the elongated projectile has much greater weight to overcome the resistance, or in other words the resistance is distributed over a greater number of particles, and its effect upon each particle is less than that upon the fewer particles of the spherical shot. Now although the spherical shot may have a much greater initial velocity than the elongated, yet it experiences a much greater retardation, and its velocity is much more rapidly diminished, the result is that the flight of the spherical shot is considerably less than that of the elongated shot, which latter travels at a more uniform speed throughout its flight."

On the subject of breech-loaders I may quote from the text book as follows:—

"The advantages of breech-loaders are, 1st, celerity of fire; 2nd, easy loading in any position; 3rd, they are generally more easily cleaned and examined.

"Any breech-loading gun which can, by accident or design, be fired before all its parts are properly in place, is a defective and highly dangerous arm to those who use it, and totally unfit for any practical purpose in warfare.

"The disadvantages of breech-loaders are, 1st, the disposition of the gas to escape at the breech; 2nd, a tendency to a waste of ammunition; 3rd, they generally cannot be loaded with loose powder; and 4th, they do not shoot as strong as muzzle-loaders.

"Breech-loaders, as a rule, require a special cartridge. The escape of gas round the joint at the breech is generally prevented by placing a wad at the base of the cartridge, which consequently rests against the breech, and receives the force of the explosion, whereby it is detached from the cartridge and retained in the barrel. This wad, on the introduction of the next cartridge, is pushed in front of the bullet, and in its passage out tends to clean the barrel.

"The breech-loading arms in general use are as follows:—Prussian needle gun, Zündnadelgewehr; Green's and Prince's, barrels move forward, junction behind the cartridge; Sharp's, junction behind the cartridge, breech drawn down by the trigger-guard; Calisher and Terry's, junction behind the cartridge, the barrel projects above the stock, breech moveable by a backward motion; Storm's, junction in front of the cartridge; the chamber to receive the charge hinges on the upper part of the barrel, and is turned back towards the muzzle to load; Westley Richards', junction behind the cartridge, breech moveable by an upward motion.

"Within the last six years breech-loading carbines on Green's and Sharp's principle, both Americans, and Westley Richards', of Birmingham, have been issued to some of our cavalry regiments, all of which, Lancers excepted, are to be armed with the Westley Richards breech-loading carbine. One thousand Westley Richards' breech-loading muskets were supplied to the Government in 1862, and have been issued in small numbers to several battalions for practical trial.

"The difficulties attending the construction of breech-loaders are chiefly mechanical, and that of closing the breech effectually to prevent the escape of gas is the principal. This, however, has been overcome in some systems, first by Colonel Green, of the United States army."

Colonel Wilford explained verbally, at considerable length, the construction of the various forms of rifle, dwelling especially on that of Mr. Whitworth, of which he spoke in very high terms. He urged the importance of the breech-loader, particularly as affording facilities for loading in a recumbent position, and also for rapid firing in all positions. He insisted that the soldier was entitled to have placed in his hands the best weapon that could be produced; that the arm should not be, as it were, lowered to the present capacity of the soldier, but that he should be raised by education and training to such a state of efficiency as to be able to use a weapon requiring delicate handling and careful management.

In conclusion, Colonel Wilford pointed out how important it was, in the interests of peace, that our army should be brought to the highest state of efficiency. The object of our military organisation now was not to provoke war, but to prevent attack. This remark of course especially applied to the volunteers; and he observed that, in his opinion, that great movement would, to some extent, have failed in its object, if the volunteers were ever called upon to fire a shot.

DISCUSSION.

Mr. C. F. DENNET, after expressing the interest he had felt in Colonel Wilford's paper, said it was to this Society, as the originator of the Great Exhibition of 1851, that was due the great progress that had been made in the manufacture of fire-arms in this country, for in that Exhibition the display of fire-arms in the American department drew attention to the subject, and led to the introduction of machinery into this country for their manufacture, besides getting rid of the protective laws which hitherto had so much fettered progress. In December, 1851, he (Mr. Dennet) received from Colonel Sam. Colt, then embarking for America, authority to act as his agent in this metropolis (which he did for 12 years until his decease) for the manufacture and sale of his fire-arms. The capital to start with was only fifty pounds. After taking premises for carrying out the works, it was discovered that the importation of machinery was prohibited, as well as the sale of foreign arms. Nothing daunted, however, with the encouragement and efficient aid of Mr. Charles Manby, he applied to the Lords of the Treasury, asking leave to import and use American machinery in the manufacture of the revolver. He was received with politeness, but met with a decided refusal. During the discussion with the Treasury in 1852, the Kaffir war broke out, and the few "new fangled" weapons which Col. Colt had given to the lancer regiment embarking for the Cape had been tried with success. Officers had learned the use of the arm and its value in contending with a treacherous enemy. The demands for them became frequent and increased. But he was not allowed to sell them. They were foreign. Those left over from the Exhibition were locked up in the Custom-house, and it was necessary for an applicant to write to the Treasury requesting their lordships to grant them "the favour of purchasing of Colonel S. Colt, or his agent, one of the Colt's revolvers now at the Custom-house, on payment of a fixed duty thereon." With the official reply in his hand, the purchaser finally got his pistol, and his name was duly gazetted. These requisitions becoming too frequent, the Treasury at length gave him permission to import the necessary machinery. 30,000 pistols were immediately put in hand, and, for the first time in the history of British manufactures, all the materials of the weapon—metal, wood, &c., went in at one door and came out at another finished pistols—wholly made by machinery. The Kaffir war had gone on, the Crimean had begun—the demand was increasing. He could sell his "Colt's" without difficulty. There was no prohibition against exportation; and before he received an order from this Government he had supplied 5,000 to the Egyptian Government. Admiral Plumbridge, who saw by accident some officers of the 15th trying their Colt's revolvers against "Brown Bess," at Portsmouth, was his next patron. He had been made a convert by seeing the pistol beat the gun; he came to town, made requisition through the Admiralty for the next large demand, which was 9,000, and took them to the Baltic. After three years' experience the value of this arm became thoroughly acknowledged, and the Government sent commissioners to America to

examine the works at Springfield. This ultimately resulted in the establishment of the Enfield factory, although some were still found to say, before a Parliamentary Committee, that the manufacture of arms by machinery was impracticable. It then became a mania to make fire-arms. Since the year 1851 more patents for fire-arms had been taken out than during the whole fifty years previous to that date. With reference to Colonel Wilford's paper, he begged to differ from him as to the merits of the Enfield rifle, a weapon which, in his (Mr. Dennet's) opinion, was capable of being made to shoot with wonderful accuracy; indeed, he thought it was surpassed by no other rifle, though he did not wish to detract from the merits of Mr. Whitworth, who had doubtless done much by the improvements he had introduced.

Mr. C. F. T. YOUNG said he believed the invention of the expanding bullet was due to Capt. John Norton in the year 1818, and it was first applied in England in the year 1823. It was mentioned by Sir Richard Airey that in that year this form of bullet was exhibited at Woolwich in his presence.

Capt. J. SELWYN, R.N., rose to express the very deep debt of gratitude which he felt they all owed to instructors in musketry in general, and to Col. Wilford in particular. Col. Wilford had touched upon one subject of the highest importance. He had recognised the fact that certain proceedings had taken place which indicated extreme stupidity on the part of those who conducted our public affairs twenty or thirty years ago, but did not point out how we might guarantee ourselves against the recurrence of such stupidity. Those who should be the judges in these matters were often inventors themselves, personally interested in special forms of the weapons which they were called to pass judgment upon, and therefore there was not that free and unbiased judgment from which alone we could obtain the best weapon with which to arm our troops. Colonel Wilford had said that successful shooting depended more upon the ammunition than on the weapon itself; but in his praise of the Whitworth rifle this had been put out of view. Now, he (Captain Selwyn) would engage to take an ordinary smooth-bore musket—with a bullet, it was true, of very different shape—a cylindrical bullet, open from end to end, internally grooved, and deriving its rotation from the air in the most perfect manner—and giving 300 yards greater range than the best rifle now existing, and with the same charge and the same elevation, would give equal accuracy, with greater velocity and less strain on the gun. The device of rifling had resulted from the discovery that it was necessary to produce rotation of the bullet, but it must be allowed that that rifling must necessarily throw an increased strain on the piece, and must diminish the velocity with which the projectile left the weapon. This was equally true with large ordnance as with the musket. The bullet to which he referred was an open cylinder from end to end; it had no area of greater resistance to the air than the small elongated projectile. The air passed through it, and there was this remarkable fact, that there was no partial vacuum behind it, which every engineer knew contributed to the retardation of the flight of the projectile. The expanding plug bullet referred to favourably in the paper was, he thought, a doubtful success, for the plugs generally, if not fitted very tightly into the bullet, left the bullet within 200 or 300 yards of the target. He had himself gathered up large quantities of iron plugs which had fallen short. In modern bullets these plugs were omitted, and equal results were obtained by providing for the expansion of the lead into the grooves of the rifle. The next point he would touch upon was the statement of Colonel Wilford that correctness of shooting was impaired whenever the bullet was behind the junction of the breech chamber, in breech-loading guns, instead of absolutely at the base of the barrel. The fact was, however, that the barrel was the director of the bullet, and the chamber was merely the place where the power was generated. It was thus clear it would take a considerable amount of eccentricity, such as they had no reason to apprehend from a well-fitted breech-loader, to diverge the flight of the bullet after leaving the barrel. The rifle which had received a large amount of praise from Colonel Wilford was the Westley-Richards rifle. He had seen and handled that weapon, and it required more motions, and more special ammunition, and he considered it had fewer advantages than many other breech-loaders. There was one principle which could not fail to be of value, and would apply to the whole question of breech-loading, viz., that the rifle must be made for the ammunition rather than the ammunition for the rifle. If then they made a perfect ammunition, and devoted their attention to causing the transmission of the bullet with as little loss of power as possible, and in a straight line, they would have fulfilled the necessary conditions. If, again, in making a rifle, they reduced the wearing points to a minimum, consistent with the maximum of effect, they would obtain a great advantage—and if grooving could be done away with altogether, preserving accuracy of shooting, he thought they would thus have the most perfect weapon. The public were exceedingly disappointed at hearing from the mouth of an officer of state that there now existed a system of taking up a single weapon, to the exclusion of all others that might be introduced—or merely improving upon that weapon till it came to be regarded as a perfect one, and then saying, "We have made such improvements in this that we will not look at anything else." This was neither fair nor statesmanlike. On the contrary, let the best weapons be tested fairly, by officers who were known to be impartial, and who were not irremovable. Let those weapons, having passed a preliminary test, be subjected to the only really conclusive test, which was placing them in the hands of our soldiers. Let them be given, in sufficient numbers, to regiments in active service, or, short of that, to regiments where good ranges were obtainable, and let those rifles be fairly reported on. They would then know what rifle succeeded best, and that upon which they could confidently rely, before the order was given for the construction of a large number of them.

Mr. LANG, understanding Mr. Dennet to have claimed for Col. Colt the invention of the revolver introduced in 1851, begged to say that he saw an application of that principle to fire-arms as early as the year 1840.

Mr. DENNET explained that he had not claimed for Col. Colt the invention of the revolver, but that he had been the first to introduce the manufacture of small arms by machinery into this country.

Colonel WILFORD, in reply, said he did not consider himself competent to enter into the question of the manufacture of guns; but with regard to the Enfield rifle, it was a remarkable fact that it had never been employed in shooting for the Queen's prize, and he had thus a right to assume that this was because it could not do the work. He had spoken of the Enfield as it was, not as what it might possibly be made. When he spoke of the Whitworth rifle he did not give his private opinion merely, but the printed opinion of the authorities, coupled with the fact that that rifle had been, he believed, in every case used in the contests for the Queen's prizes; and with regard to the other leading rifles, they possessed the same principle of spirality and size of bore which were originally determined by Mr. Whitworth. With regard to what had fallen from Capt. Selwyn, he would say that the breech-loaders submitted to the authorities in which the junction was made in front of the ammunition were not considered so successful as those in which the junction took place behind the ammunition. He was aware of the imperfections of the Westley-Richards rifle, and had never regarded it as a perfect weapon. He did not question the fact of rotation being given to a hollow cylindrical bullet in the way Capt. Selwyn described, but he (Col. Wilford) had received dozens of plans and suggestions for bullets, the whole of which had failed. If the projectile referred

to by Capt. Selwyn was as successful as had been described, all he could say was, its merits were not as yet publicly known, and he should be delighted to find that it realised all the advantages that were claimed for it, and that its success with the smooth bore was established.

The CHAIRMAN said he was sure that all present had listened with the greatest pleasure and delight to the very able paper with which Col. Wilford had favoured them on a subject of such vital importance as the weapon with which our soldiers should be armed. He thought, whatever the judgment of the meeting might be in regard to the points of superiority of one weapon over another, there would be no difference of opinion as to the importance of giving our soldier the very best weapon that it was within the power of art to produce. It was of the utmost importance that the soldier should have full confidence in his weapon; and, with reference to the discussions which had recently taken place, he thought much that Col. Wilford had said must tend to re-assure the minds of those who had been led to suppose that we were somewhat over-refining our system of infantry instruction. He believed it was most necessary that they should combine two things in the weapon of the soldier, viz., the power of coping with his enemy at a distance, and the power of closing with the greatest effect; and perhaps the most perfect soldier was he who combined the greatest amount of caution with the greatest amount of pluck. As an artillery officer perhaps it was somewhat presumptuous in him to offer an opinion on the subject of small arms; but from an experience of some thirty-four years, the greater part of which had been passed in the field, he had learnt to see the transcendent value of the rifle as a weapon. It happened that during the recent war in India he was closely associated in the field for months with a regiment just arrived from the Mauritius, and which was one of the first that had gone through the new course of instruction with the Enfield rifle. The men, on their first arrival, complained of the severe discipline to which they had been subjected during the previous six months by their commander, Major Simmonds, having been called out frequently twice a day for rifle practice for several hours together. A few days after these complaints ceased, for when they found themselves opposed to a force of the enemy twenty times their number, they discovered the value of the teaching they had undergone. The only way in which it was possible for so small a body to overcome the superior numbers opposed to them was by extending them in light infantry order, and making available the superiority of their fire. By this means they kept their formidable enemy at bay during the greater part of the day, till the opportunity was offered of charging with the bayonet, which led to a glorious termination of the day's struggle. Speaking of this action afterwards, the men confessed how great were the benefits of the severe system of teaching which they had gone through in the Mauritius, and he had no doubt such would ever be found to be the case. No one who had seen what the British soldier could do in the field, would have the least hesitation in supplying him with the very best weapon that could be turned out, and giving him the best instruction how to use it. The gallant Chairman concluded by proposing a cordial vote of thanks to Colonel Wilford for his very able paper.

The vote of thanks was carried by acclamation and duly acknowledged.

IMPROVEMENT OF DWELLINGS FOR LABOURERS AND ARTISANS.

The following is the draft of a bill which has been prepared under the direction of a Joint Committee of the Society of Arts and the National Association for the Promotion of Social Science. It will be brought into Parliament by Mr. Charles Buxton, M.P. The bill is "To facilitate the removal of houses which are unfit for human habitation, and the erection of improved dwellings for artisans and labourers:"—

Whereas it frequently happens that the houses occupied by the labouring classes are unfit for human habitation, or pestilential, or a nuisance to the neighbourhood in which they are situate, and it is expedient that facilities should be afforded for the demolition of houses of that character, and the erection on the site thereof of improved dwellings for artisans and labourers:

Be it enacted by the Queen's most excellent Majesty, by and with the advice of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows (that is to say),

1. This Act may be cited for all purposes as "The Improvement of Dwellings for Labourers and Artisans Act, 1866."

2. In the construction of this Act the following words and expressions shall have the several means hereby assigned to them, unless there be something either in the subject or the context repugnant to such construction.

"The Secretary of State" shall mean Her Majesty's Principal Secretary of State for the time being for the Home Department.

"House" shall include any house, cottage, or other building used for human habitation, and any outbuildings, offices, yard, garden, curtilage, or land attached to or belonging to any such house, cottage, or other building.

"The Premises" shall mean any houses with respect to which the powers of this Act are put in force.

"Owner" shall have the same meaning in this Act as in "The Lands Clauses Consolidation Act, 1845."

"Municipal Corporation" shall mean the mayor, commonalty, and citizens of the City of London, and the mayor, aldermen, and burgesses of any borough acting by the council.

"Building Company" shall mean any society, company, or association incorporated under "The Companies Act, 1862," or by any special Act of Parliament or Royal Charter, for the purpose, either solely or amongst other things, of purchasing land, and building thereon.

3. "The Lands Clauses Consolidation Act," 1845," and "The Lands Clauses Consolidation Act, 1860," are incorporated in this Act, except the sixteenth and seventeenth sections of "The Lands Clauses Consolidation Act, 1845," and the provisions as to providing for access to the special Act, and save so far as any other of the provisions of those Acts respectively are expressly varied by or are inconsistent with the provisions of this Act.

4. Any municipal corporation or building company may apply to the Secretary of State for a certificate under this Act.

5. Such application shall be made by a memorial in writing, under the common seal of the municipal corporation or building company applying.

6. Every such memorial shall particularly describe the houses in respect of which the certificate of the Secretary of State is sought, and state the names of the owners thereof, so far as the same are known to the applicant, and shall also state that such houses are unfit for human habitation, or pestilential, and a nuisance to the neighbourhood in which they are situate, and the grounds for such abatement, and that the applicants are willing to pull down the same, wholly or partially (as may be requisite), and erect on the site thereof dwellings proper and suitable for artisans and labourers.

7. Every such memorial shall be accompanied by plans and specifications showing the mode in which the applicants propose to appropriate the sites of the houses mentioned in the memorial, and generally the works

proposed to be executed, and by an estimate, to be signed by an architect, of the cost of executing the proposed works.

8. Notice in writing, or partly printed and partly in writing, of any intended application to the Secretary of State for a certificate under this Act, shall be served on the owners of the houses in respect of which the certificate is sought, one calender month before the application is made.

9. Where the residence or place of business of any owner of the said houses is known to the intending applicants, such notice shall be sufficiently served if the same is left at his residence or place of business, or sent by post in a registered letter addressed to him at his residence or place of business. Where any owner or his residence and place of business is or are not known to or after diligent inquiry cannot be ascertained by the intending applicants, then the notice shall be sufficiently served if the same is left addressed to the owner with some occupier of the houses in respect of which the certificate is sought, or affixed on some conspicuous part of such houses, and a copy thereof is advertised in the *London Gazette*, and in some newspaper circulating in the district in which the houses are situated.

10. Any owner may apply by a memorial in writing under his hand, to the Secretary of State, in opposition to any application for a certificate under this Act.

11. Before proceeding to consider any application for a certificate under this Act, the Secretary of State shall ascertain whether the applicants have served the notices required by this Act, and before granting a certificate he shall take into consideration any representation made to him in opposition to the application.

12. The Secretary of State may require any evidence to be laid before him, on behalf either of the applicant for a certificate or of any opposing owner, as to any of the matters respecting which his certificate is sought, or in explanation or support of the plans, specifications, or estimates accompanying any such memorial as aforesaid, and may require any of the inspectors or other officers appointed under "The Local Government Act, 1858," to inspect the houses in respect of which a certificate has been applied for, and report as to the state thereof, and generally may direct such other inquiries to be made as he shall think proper.

13. The costs, charges, and expenses, of every such inspection and report and all such inquiries shall be borne by the applicants for a certificate, and the amount thereof to be fixed by the Lords Commissioners of her Majesty's Treasury, shall be a debt due to her Majesty.

14. The Secretary of State may either refuse any application for a certificate, or if he is satisfied of the following matters (that is to say):—

(1.) That the premises described in the memorial presented to him by the applicants, or some part of them, are or is unfit for human habitation, or pestilential, and a nuisance to the neighbourhood in which they are situate;

(2.) That dwellings proper and suitable for artizans and labourers are needed in that locality;

(3.) That the applicants are in a position and have the means to execute the works referred to in the plans and specifications accompanying their memorial, with such additions thereto, or alterations and modifications therein, as the Secretary of State shall direct;

(4.) That it is fit and proper that the applicants should have and exercise powers for the compulsory purchase and taking of the said premises or any part of them—

the Secretary of State shall make and issue a certificate to that effect under his hand, which certificate may be in the form contained in the Schedule to this Act. Such certificate shall also prescribe the period after the expiration of which the powers of the municipal corporation or building company named in the certificate for the compulsory purchase and taking of the premises shall not be exercised, and may prescribe any other special terms and conditions which the Secretary of State may deem reasonable, under the circumstances of the case.

15. As from the date of the certificate the municipal corporations or building company named therein may enter upon the premises mentioned in the certificate, and take and use the same for the purpose of executing the works approved by the Secretary of State.

16. In the construction of "The Lands Clauses Consolidation Act, 1845," and "The Lands Clauses Consolidation Act, 1860," (so far as the same respectively are incorporated in this Act), any municipal corporation or building company to whom a certificate has been granted under this Act shall be deemed to be "the promoters of the undertaking," and the premises mentioned in the certificate shall be deemed to be "the lands by the Special Act authorised to be taken."

17. The Secretary of State may either approve the plans and specifications for the appropriation of the site of the premises, or may direct any additions thereto or alterations or modifications therein, and no subsequent alteration, modification, or addition shall be made in or to the plans and specifications as approved by the Secretary of State, without his approbation and consent.

18. No municipal corporation shall exercise any of the powers of this Act except with respect to any houses situate within the limits of their own city or borough.

19. Wherever two or more applications are made to the Secretary of State for a certificate under this Act in respect of the same houses, the Secretary of State shall have regard to the order in which the applications have been made, and shall not grant a certificate upon a later application, unless he is satisfied that he ought to refuse every earlier application; but if two or more applications are made on the same day, the Secretary of State may grant a certificate upon such one of the applications as he shall think best.

20. Every notice served by any municipal corporation or building company exercising the powers of this Act in pursuance of the eighteenth section of "The Lands Clauses Consolidation Act, 1845," shall be accompanied by a printed copy of the certificate.

21. The municipal corporation or building company exercising the powers of this Act shall, within three calendar months after they shall have obtained possession of any part of the premises, proceed with all reasonable speed to execute the works shown on the plans and referred to in the specifications as approved by the Secretary of State; and if any such corporation or company shall make default therein the Secretary of State may authorise and direct any other person, association, or company, by themselves, their contractors, servants, workmen, and agents, to enter upon the premises and execute the works, so far as the same shall be incomplete, and reimburse themselves all costs, charges, and expenses incident to the execution of such works, by sale of the old materials, so far as the same may extend, or may recover from the parties making default the amount of such costs, charges, and expenses, as a debt in any superior court of common law, and shall have an express charge upon the premises in respect of such amount, which charge may be realised by a sale of the premises or any part thereof.

22. Until the works are completely executed, the municipal corporation or building company exercising the powers of this Act shall not sell, demise, or lease the premises or any part thereof, or transfer their liability to execute the said works, or part with their control over the execution thereof, to any person, association, company, or corporation, who shall not have been previously approved of by the Secretary of State for that purpose; provided that nothing hereinbefore contained shall prevent any building company raising upon mortgage of the premises or any part thereof any sums of money which they would otherwise be authorised to raise.

their Articles of Association, or the provisions of the Act of Parliament or charter under which they are incorporated; and any municipal corporation may, for the purpose of enabling them to execute the works, borrow from time to time such sums of money as the Secretary of State shall approve upon mortgage of the premises or any part of them, but no person advancing any money shall be bound to see to the application thereof.

23. Whenever the architect of the municipal corporation or building company (as the case may be) exercising the powers of this Act shall certify that the works are completed, the premises acquired by any municipal corporation under this Act may from time to time be sold, exchanged, mortgaged, charged, demised, leased, or otherwise dealt and disposed of, in like manner as any other land or premises, part of their corporate estate, but in cases where the approbation of the Lords Commissioners of her Majesty's Treasury, or any of them, is required for any such disposal, then only with that approbation; and the premises acquired by any building company may be dealt with and disposed of to such extent and in the like manner as any other property of a similar character belonging to such company may be dealt with or disposed of according to their articles of Association or the provisions of the Act of Parliament or charter under which they are incorporated.

24. The municipal corporation of any borough to which "The Public Health Act, 1848," has been applied, or which has adopted "The Local Government Act, 1858," may from time to time raise as part of the general district rate the monies which they require for the purposes of this Act, and may from time to time borrow by mortgage of the rate any sums of money, subject to the provisions as to borrowing on mortgage of the rate contained in "The Public Health Act, 1848," so far as the same are unrepealed), and "The Local Government Act, 1858," which provisions shall be deemed to be incorporated with this Act, and shall extend and apply to the monies to be borrowed under this Act, as if the same had been expressly re-enacted here.

25. All the monies produced by the mortgage, sale, or other alienation of any premises required by any municipal corporation under this Act, and the rents, issues, and profits of the premises so acquired, and not sold or aliened, and the monies raised by such corporation by the general district rate for the purposes of this Act, and the monies borrowed by such corporation for the purposes of this Act, and all other monies received by or to the use of such corporation, under the powers of this Act, shall forthwith after the receipt thereof be paid to the treasurer or other officer of the corporation whose duty it is to receive the monies belonging to the corporation, and carried by him to a separate account, and the same shall be applied in defraying all the expenditure and liabilities of such corporation, under the powers and for the purposes of this Act, including the expenses of lighting, repairing, and maintaining the premises, and any other expenses in respect thereof, and including the interest on any monies borrowed for the purposes of this Act; and the instalments of such monies which shall be presently payable, or (if it has been arranged to provide for the repayment of the monies borrowed by means of a sinking fund) the sums necessary for the formation of a sinking fund, and the surplus (if any) shall be carried to such sinking fund (if any), or be otherwise applied in paying off any monies borrowed for the purposes of this Act, and the ultimate surplus (if any) shall be carried to the credit of the general rate.

26. Every municipal corporation, exercising the powers of this Act shall keep a distinct and separate account of all their receipts, credits, payments, and liabilities under this Act, and the provisions contained in "The Local Government Act, 1858," with respect to the audit of accounts in districts where the municipal corporation are the local board, shall be deemed to be incorporated with this Act, and shall extend and apply the receipts and expenditure of any municipal corporation under this Act, as if the same were expressly re-enacted.

27. Any certificate purporting to be signed by the Secretary of State, and to be made and issued under this Act, shall be receivable in evidence by any Court of Justice, without further proof thereof, or any proof of the handwriting of the Secretary of State.

28. This Act shall not extend to Scotland or Ireland.

SCHEDULE.

"*The Improvement of Dwellings for Artizans and Labourers Act*, 1866."

[A short description of the premises intended to be taken.]

I, the Right Honourable Her Majesty's Principal Secretary of State for the Home Department, do hereby, in exercise of the powers given to me for this purpose by the above-named Act, certify as follows (that is to say),

[Here to follow the matters certified, in which the premises intended to be taken are fully described.]

And I prescribe as the period after the expiration of which the powers of the said for the compulsory purchase or taking of the said premises or any part thereof shall not be exercised. And I direct

[Here are to follow any special directions.]

Whitehall,

Dated this day of

(Signed)

Her Majesty's Principal Secretary of State for the Home Department.

Proceedings of Institutions.

BIRMINGHAM AND MIDLAND INSTITUTE.—The report for 1865, presented at the annual meeting, January 8th, 1866, congratulates the members upon the steady progress made by the Institute, and speaks of the constant and steady increase in the numbers attending the various classes. The free library and the gallery of art are both completed, and, through the kindness of the Town Council, the Institute has on more than one occasion derived considerable advantage from having the latter room placed at its disposal. The central hall and staircase are also fully completed. In consequence of the completion of the free library, the specifications of patents have now been removed from the council-room to the central reference library; and the council has also placed the Institute collection of paintings in the gallery of art, on the condition that the Institute shall be at liberty to remove them, on giving one month's notice of its intention of so doing to the Town Council. Several valuable donations have been received during the past year. The number of members of the Institute is slightly diminished since the commencement of the year. The lectures delivered on the Monday evenings have been made as interesting and attractive as possible. It has been decided to establish a class in elementary chemistry, exclusively for the use of subscribers and resident members of their families. The number of public lectures given during the past year has been thirty-one, and the average attendance has been in excess of that of former years. Of these lectures two have been given gratuitously by Lord Lyttelton and the Rev. G. D. Boyle. Since the opening of the free libraries a large addition has been made to the number of persons visiting the museum; the numbers being 2,512 for the past year, as against 1,229 in 1864. The council has paid considerable attention to the re-arrangement of the museum. Considerable additions have also been made to the number

of papers supplied to the news-room. In the industrial department the number of students attending the various classes has largely increased, the total number of persons now receiving weekly instruction in connection with this department amounting to 1,067. The penny lectures given during the year have been generally well attended. The Rev. G. D. Boyle, Mr. Waterhouse Hawkins, Mr. Gausby, and Mr. C. J. Stevens, have kindly given their services in the gratuitous delivery of lectures in this department. The council has been enabled to establish a class for the study of geology. Upon the recommendation of the teacher of the arithmetic classes, the charge for admission to the advanced arithmetic class has been changed from a quarterly payment to one of a penny on admission to each lecture. This change has been attended with complete success. The council regrets that the financial condition of the Institution is not so satisfactory as it appeared to be in the accounts presented at the last annual meeting. There is a deficiency in the general department of £191 2s. 2d., which is mainly caused by the exceptional outlay incurred in painting the building, the cost of which w s £163 18s. 6d. In addition to this will be found, for the first time in the accounts, an item for property tax and inhabited house duty amounting to £40 12s. 6d. The council has endeavoured, by an appeal to the commissioners, to obtain relief from this charge, but has only succeeded so far as to reduce the amount, and the funds of the Institute will henceforth have to bear this serious burden. The council has resolved to co-operate with other public bodies in calling the attention of the government to the subject of the inhabited house duty, with the view of obtaining an exemption for such parts of the building as are not actually occupied for the purposes of residence. The increase in the number of students has caused a corresponding augmentation of the class fees received, but this has been more than counterbalanced by additional expenses, and the accounts of the industrial department show a deficiency of £137 16s. 6d. The total deficiency on the two accounts therefore amounts to no less than £328 18s. 8d. The reports of the class teachers in the various subjects—Chemistry, experimental physics, arithmetic and mathematics, elementary singing, French, English grammar and composition, botany, writing, German, practical mechanics, English history, geology, and the English language and literature, are generally most favourable.

NEW ZEALAND EXHIBITION.

A copy of the reports and awards of the jurors of this exhibition has recently come to hand, forming an interesting and highly creditable volume of 540 pages, containing a mass of valuable information. Adverting first to the mineral products, it is stated, as a matter of congratulation, that this class received a large amount of attention from exhibitors. When the vast value of mineral resources is considered, it becomes a matter of the utmost importance, particularly in a new country, that their existence should be ascertained, and their extent, variety, and character made known. The possession of valuable minerals is one of the richest endowments of a country, and without it no country can hope to take a place amongst the great and powerful nations of the world. To Englishmen, who of all others carry with them, wherever they go, the habits of active industry and commercial enterprise which have raised Great Britain to its present position amongst the nations, it is a matter of necessity that the country in which they seek to erect another England should contain within itself those natural elements which are necessary for the support of commercial and manufacturing prosperity.

That New Zealand has been amply endowed by nature with the possession of valuable and necessary raw material was fully shown by this exhibition, and in nothing has she been more bountiful than in the mineral treasures which are so widely distributed over the colony. To make known the extent and value of these gifts was one of the chief purposes of the exhibition, and this aim has b en accomplished to an extent that few could have anticipated. In these days of restless commercial activity and ceaseless and never-satisfied demands of manufacturing industry, no useful product can long remain neglected when once its existence is authenticated. Circumstances may, in some instances, delay the period of utilisation; but as colonisation proceeds and population increases, will come the demand for new channels of industry, and the arts and manufactures will assume daily increasing importance. The day may be distant when the forests and fertile plains of New Zealand will resound with the clang of the forge or the hum of the factory, and the midnight glare of the furnace illumine the surface of her lakes and rivers, but it is no mean thing for the colonists to know that they have at their hands the elements which will set in motion and force those great engines of civilisation.

New Zealand possesses all the principal minerals and metals, besides a great variety of those of less importance. The following is a list of the most important, a glance at which is sufficient to show how favourably circumstanced the colony is in its mineral resources:—

COAL.—A country without coal is deprived of perhaps the most powerful agent of civilisation. In these days of steam-engines, steamboats, and railways, on the use of which we are so much dependent for commercial intercourse and the provision of innumerable wants, coal, the prime mover of all this vast machinery, is an absolute necessity, and if it be not produced within our own country, we must draw our supplies at great cost from other places. It is a fortunate circumstance that, with few exceptions, wherever important British colonies have been founded, there has also been found a local supply of coal. Thus the colonists of that race which above all others has attained great national prosperity by means of its vast mineral wealth, will find in their new countries the same agent by which to build up a like greatness. New Zealand is, fortunately, no exception to this rule. Coal has been found to exist in immense quantity widely distributed over the colony. As yet the absence of cheap means of transit, the dearness of labour, and want of capital, have prevented any extensive development of the coal-fields of the colony, but it cannot be doubted that these drawbacks will decrease with the progress of settlement and the increase of population, and the coal deposits of New Zealand will prove a source of national wealth.

COPPER.—This valuable metal is found in various parts of New Zealand; ore of rich quality was discovered years ago on the Great Barrier Island. Very pure samples of copper ore were exhibited in the Nelson department, some of which were of extraordinary richness. Important discoveries of copper ore have been made in Otago, the ore in some instances being of very rich quality.

CHROME.—This useful mineral has chiefly been found in the province of Nelson, at the Dun mountain, where it has been extensively worked. The quantity of chrome exported from New Zealand amounts to about 6,[illegible] tons. Chrome is extensively used in the arts for making pigments. From it also is made chromic acid, a valuable agent in bleaching and dyeing. Owing to the lessened demand in England for this mineral, the price has fallen from £10 10s. per ton to £5, and at the present time it is not found renumerative to work the mines in the colony.

GOLD.—If New Zealand can boast of its deposits of the baser metals, it can also lay claim to the possession of some of the richest gold-fields in the world for the area they occupy. The wondrous impulse which gold discoveries give to colonisation, and the extraordinary commercial progress which they induce, have been strikingly manifested in modern times. California, Au-tralia, British Columbia, and New Zealand, all afford instances of the wonderful effects which are produced by the development of auriferous deposits. As agencies in colonisation, gold dis-

veries exercise a gigantic influence. They draw population, lead to the opening up of distant wilds to civilisation, and carry in their wake all the industries necessary for the progress of a numerous population. In New Zealand gold has effected transformations impossible under the ordinary process of colonisation. Busy and thriving populations are in a few weeks planted in localities previously remote and unknown. Tracts of country which under other circumstances would rest in primeval desolation for many years, become suddenly thrown open, and prosperity, rapid and brilliant, is created. All this is still being done in New Zealand, and the progress of discovery is gradually revealing the existence of rich auriferous deposits in almost every part of the colony. An obelisk in the exhibition represented 103 cubic feet of solid gold, being the quantity exported from April 1st, 1857, up to the 31st December, 1864, 1,749,511oz.. of the value of £6,771,730; up to the 31st March, 1865, the total was £7,054,544.

IRON is exceedingly common in various parts of the colony in the form of magnetic iron sand. Clay iron ore, carbonate of iron, and red hematite are found in considerable quantities in the colony.

SILVER has only as yet been discovered in small quantities in New Zealand, and generally alloyed with other metals.

LEAD has been found in the provinces of Nelson and Otago.

MERCURY has been discovered in the form of cinnabar, but has not yet been found *in situ*.

Excellent BUILDING STONE is found in every part of the colony. Plumbago has been found in quantity in the province of Nelson, where it occurs in thick beds interstratified with metamorphosed slate.

SULPHUR exists in immense quantity at White Island, a volcanic island on the east coast which is covered with it. No attempt has yet been made to turn these deposits to commercial account, although there cannot be a doubt that at some day they will prove of great value. Gypsum is found in various parts of the colony. From the oxide and silicate of manganese valuable preparations used in various processes of dyeing are manufactured.

HORSE EXHIBITION IN PARIS.

It is well known in England that great attention has been paid of late to the breeding of thoroughbred horses for racing purposes; but the same attention is also, wisely, being given to the improvement of half-bred and other horses for general purposes. Exhibitions of horses have taken place in many of the departments; in fact, these animals are now included in most regional agricultural shows, and last year there was anexhibition of the kind in Paris. An extremely fine collection has recently been on view in the Palais de l'Industrie. The exhibition was peculiarly interesting, from the completeness of the arrangements and regulations. It was organised by the Société Hippique Française, the members of which are amongst the most distinguished persons in France, the list of the founders being headed by the names of the Emperor, the Princess Mathilde, the Prince Napoleon, and Prince Joachim Murat. The committee of the Society has for its president the Marquis de Mornay. The horses were divided into five classes, and the medals and premiums to be awarded were sixty-one in number, and of a total value of 50,446 francs. There were, moreover, two grand medals of honour, without any money premium attached.

The following are the classes established by the committee:—

1st Class. Horses for large carriages and for posting This class included 72 specimens.

2nd Class. Horses for light carriages, whether with two or four wheels. There were 110 horses exhibited in this class.

3rd Class. Saddle-horses. This included 39 animals.

4th Class. Horses, cobs, and ponies, from four to seven years of age, and less than 15 hands high; these numbered 27.

The 5th class, or extraordinary prizes, included one of 3,500 francs for the most remarkable pair of horses, both in harness and for the saddle; one of 2,000 francs for the best single horse both for riding and driving; one of 1,500 francs for the most remarkable saddle-horse; and one of 1,000 francs for the first small riding-horse, cob, or pony, trained also either to double or single harness.

The two Prize Medals of Honour were for the best and second best stable of five horses or more, between the ages of four and seven, and of any size. The Emperor contributed, in competition for these prizes only, five carriage-horses, sixteen posting-horses, twenty mares of Norman origin for posting, three saddle-horses, and three small carriage horses. Twelve horses of the Cent Gardes were also entered for the Medals of Honour. The Imperial Cavalry School of Saumar also exhibited, but not in competition. The number of animals in the exhibition was 357 in all.

The whole of the central portion of the Palais was laid with sand, and reserved for the trials of the horses before the jury. Each exhibitor might ride or drive his own horses if he thought fit, but the jury might also repeat the trial with its own men. The exercises were laid down as follows:—For horses either in single or double harness—describing the figure of 8, walking and trotting; long trot, and backing. For saddle-horses—once round the ground, walking and trotting, both to the right and left; describing a circle in the same manner; cantering round the ground to the right and left, and describing circle; galloping round and backing.

The exhibitors paid five francs entry for each horse, and all the expenses of their conveyance to and from, and their food while at the exhibition; the Society undertook the cost of superintendence, and arranged for the supply of fodder, and veterinary attendance within the building, at a fixed charge, deducting five per cent. from the premiums as a contribution towards the general expenses.

REWARDS IN AID OF ADULT EDUCATION IN FRANCE.

The extension and improvement of the courses for adult education are being aided by various means; a few months since the Imperial Government allotted eighty-nine gold medals for the encouragement of the teachers of these useful classes, and the example has been followed by a considerable number of official and private personages. The Duc de Persigny has founded a special medal to be bestowed on the best teacher in the department of the Loire; the Minister of Public Instruction has created five medals of a hundred francs each; and nine medals of fifty francs each have been given by the three chief officers of the same Ministry; M. Haeutjens, deputy for the Sarthe, has placed five medals of the value of 100 francs, and five of 50 francs, to be given to the ten most successful teachers in that department; three other deputies have founded rewards of the same kind in their departments; M. Adolphe Moreau, Maître des Requêtes, has subscribed for one medal, value 300 francs, to be given to the best instructor, and two medals of 100 francs each to be contested by the pupils in the schools of Fère en Tardenois, in the Department of the Aisne, for five years; and M. Le Ray, a member of the Conseil-General of Mayenne, has established an annual medal to be given to the most successful instructor in that place; fifteen medals of 50 francs each, and two others, of the same value, have been contributed anonymously by two persons. MM. Godchaux, publishers, have placed 5,000 writing, and as many geographical, exercise books at the disposal of the Minister; a lady, who founded a school at Mayenne, has left by will 4,000 francs for the lighting and maintenance of the class of adults; M. Paul Dalloz, the director of the

Moniteur, has contributed five medals of the value of 100 francs each; six other medals of the same value have been distributed by deputies and others—lastly, the firm of Pleyel, Wolff, and Cie., piano-manufacturers, have subscribed the sum of 200 francs, for four years, for the creation of four medals of 50 francs.

It should be observed that the word "medal" is invariably used in such cases, but that the reward is always given in money when preferred. These generous subscriptions in aid of the efforts which are being made to remove the stigma of ignorance, even in the case of the adult members of the present generation, and give France a high position in the educational scale of nations, deserve mention on their own account; and they may, moreover, effect some further benefit in the way of example.

The State holds out other inducements to young men to shake off the imp Ignorance; the directors, superintendents, and principal assistants in the tobacco factories and other establishments under government, are all taken from amongst the pupils of the Polytechnic School, but there is an inferior, and also a supernumerary class, the members of which are appointed after examination; thus is announced a competitive examination, to be held shortly, for the admission of young men into the service of the twenty-four state tobacco factories. The candidates must not be less than twenty-one or more than twenty-four years of age, unless they have served four years or more in the army, in which case twenty-eight is the maximum age, and they are submitted to written and oral examination, the former consisting of French dictation (fair copy of the same), the writing of a letter on a given subject, questions in the geography of France, arithmetic, plane geometry, and measurement; the oral examination includes a few questions in French grammar and geography, arithmetic and practical geometry. These supernumeraries may be admitted to the grade above them, if—after five years of service, and before the age of thirty-five—they can pass a more severe examination in practical matters.

ORCHID TEA.

Mr. John R. Jackson, writing to the *Gardener's Chronicle*, says:—To have to look to the Orchid family for any large staple articles of trade other than Vanilla, would be not only to look to a new field, but also to a very interesting one. The application of the leaves of one of these plants as a substitute for tea has lately come under my notice. The product has been heard of before in its native country, but never, so far as I know, in fashionable or civilised society. It has, however, now made its appearance in Paris as a regular article of trade, and is highly recommended as a most agreeable beverage.

The plant yielding this new description of tea is the *Angræcum fragrans* of Thouars, an epiphytal orchid of the Island of Bourbon, where it is known and used by the natives under the name of "Faham." This word, once an obscure native name, is now, if we are to believe the enterprising French firm who has just introduced it, destined to become a "household word," for "Faham" is the name under which it is now sold in Paris, and the word appears in large letters upon the boxes in which it is packed, as well as upon the circulars accompanying them. The headings of these circulars run as follows:—"Faham from the Isle of Réunion, imported from and manufactured at Réunion." There is also a rough, but not at all a bad cut of the plant producing it. The circular itself begins by saying that tea proper has never been well received in France, owing to the wakefulness resulting from its use, which has caused many persons to reject it altogether, while many of those who do use it drink it in default of a better substitute. The circular then goes on to state that it is for the purpose of remedying this state of things that the new infusion is intended; not to replace tea, which has indisputable advantages, but to afford an opportunity of choosing between two beverages, equally beneficial and useful. "Faham is not a new production. From time immemorial the natives of the islands of Réunion and Mauritius, though situated as it were at the very gates of China, have preferred it to tea; every traveller has partaken of their preference; one of our most illustrious writers, George Sand, eulogises it in the midst of the fine description which she gives of the Isle of Bourbon, an eulogy which cannot be suspected of puffery, inasmuch as it was written upwards of 30 years before the introduction of Faham into France was thought of. Every work on botany of any importance similarly places it in the foremost rank of the beneficial productions of this favoured clime. The difficulties experienced in the gathering and manufacture of Faham on a large scale, and consequently the almost impossibility of procuring a sufficient quantity to recompense the labour of obtaining it for consumption, and also its very high price, have alone prevented until now this valuable article of diet from being imported into France. After many fruitless attempts, these obstacles have been overcome.

"Faham belongs to the family of orchids; it grows upon the high slopes of the Island of Réunion, in the midst of almost inaccessible forests. It possesses a taste differing greatly from that of tea, and is preferred by the majority of persons who have tasted it. It can be used as a substitute for tea on all occasions, as it combines its tonic and digestive qualities, free from the sleepless effect. It possesses an aroma of great delicacy, capable of being rendered more or less pungent according to the quantity used, and it gives forth a most agreeable perfume; after being drunk it leaves a lasting fragrance in the mouth, and in a closed room the odour of it can be recognised long after. This beverage has the further advantage over tea, which requires to be drunk at the time of making, that it can be reserved for a future occasion if requisite, and may either be taken cold or [illegible] hot again. Milk, or spirits in small quantities, especially rum, serve to develop its aroma, and, lending it additional delicacy or greater strength, render it a delicious [illegible] Lastly, this valuable plant is made use of to [illegible] custards and ices, to which it communicates its delicate fragrance.

"To be taken as a warm beverage, the leaves [illegible] stalks should be placed in cold water in about the proportion of one gramme to a tea-cup, more or less, as the consumer may desire it of a greater or lesser degree of strength. The water should be immediately made to boil for about the space of ten minutes in the tea-[illegible] or other closed vessel. It should then be emptied into the tea pot or tea cups and sweetened accordingly."

A sample of this new kind of tea has recently been received at the Kew Museum; it was packed in a very neat canister-shaped box, similar to those now sold in Paris. These boxes are of two sizes, the smaller containing material sufficient for making 50 cups of Faham and sold at 2f. 50c., and the larger 105 cups, and sold at 5f. Upon opening the box in question the perfume emitted was exceedingly powerful, and very similar to that of the Tonquin Bean. The leaves, unlike those of tea, appear simply dried, not shrivelled by heat, but as flat as we should find them in any herbarium. The absence of any artificial colouring matter, or [illegible] accounts for the very light colour of the infusion.

No doubt there are many persons who would prefer the fragrance of this article to the aroma of Chinese tea, but for my part I give preference to the latter—perhaps prejudice may have something to do with it. The perfume from the teapot is certainly very agreeable, and is an undoubted novelty; and if Faham came into general use, this domestic article would serve the twofold purpose of a teapot and a "perfume vaporiser." Doubtless if these leaves can be obtained in quantities sufficient for consumption as tea, the French perfumers might also import them to advantage, if for no other use. [illegible] they would make excellent sachets.

In the Museum at Kew are some cigars made of the leaves of *A. fragrans* simply rolled in a thin tobacco leaf. They are probably very agreeable smoking, but I am unable to say if this application is a common one in the Island of Bourbon, or whether these specimens are rather a curiosity.

Fine Arts.

ART JURISPRUDENCE.—A question of some importance to dealers and connoisseurs in pictures was tried the other day before the Tribunal of Commerce of Paris. M. Jarvis purchased three pictures reputed to be by Leonardo da Vinci, Luini, and Giorgione, for the sum of fifty thousand francs, of which half was paid in cash and the rest by a bill on a banker. The purchaser, after having kept the pictures in his possession for seven months, declared that they were not painted by the masters to whom they were attributed, and demanded the return of the money paid, the cancelling of the bill given, and five thousand francs damages in addition. It was urged that the works were really not by the painters named, and the impression seems to have been that that view, in one case at any rate, was correct, but the court gave judgment against the plaintiff on the following grounds:—That the purchase was made without any reservation; that such a claim against the vendor could not be maintained unless it were shown that he had committed error or fraud to the prejudice of the buyer; but there was no question that the pictures delivered were those which had been purchased after long and careful examination; that, as regarded the work said to be by Leonardo da Vinci, "the indication of a picture attributed to a master did not include any idea of the originality of the work, but, according to usage in such matters, left the purchaser the liberty of appreciating its value at his own risk and peril; that it was for him to judge of its merit without demanding any guaranty other than of its identity with the work purchased and delivered; that, as regards the two other pictures, it was admitted by experts that there were retouches or repaintings apparent, but that such was commonly the case with works of that date; that the purchaser might have ascertained the fact for himself, and that it did not prove the falsity of the origin attributed to them by the defendant; that it appeared, on the contrary, that for more than fifty years these pictures had formed part of various galleries, and had been admitted and preserved as being the works of the painters to whom they were attributed." The sale was, therefore, declared to have been made under valid conditions, and the demand of the plaintiff rejected with costs.

SEVERE TESTS IN ART EDUCATION.—The competitions for the *Grands Prix de Rome* in the *Ecole des Beaux Arts* at Paris, were to take place during March and April, and it will be useful to give an account of the very severe tests to which the candidates are subjected. Class of Painting:—The pupils have in the first place to make an original sketch in oil, and afterwards to produce a rough picture after their own ideas—each of these has to be accomplished at one sitting; those who pass successfully through the two preliminary trials are admitted to the competition for the grand prize, and have to produce a finished sketch of a classical subject supplied to them; the time allowed for this work is seventy-two days, commencing this year on the 24th of April, and finishing on the 19th of July, Sundays and fête days not being included. During the whole of these seventy-two days, each competitor works in a loge, or small studio, to which no person whatever is allowed access; the candidates take their meals at a table provided for them, and no conversation on the subject of the competition is allowed, each pupil being thrown entirely on his own resources. Class of Sculpture:—The pupils in this class have to produce a rough original sketch, secondly a model of figures, and lastly, to produce a group of a given subject; for the last-named seventy-two days are allowed, on the same conditions as those named above. Class of Architecture:—The general conditions are the same, an original sketch, the same worked out roughly, and lastly a complete set of drawings, plans, elevations, and details, coloured, on a given subject, such as a theatre, a hôtel de ville, or other public building, for which one hundred and seventeen days are allowed. Classes of Line Engraving, and of Medal Engraving and Die Sinking:—Three tests as before, ninety days being allowed in the former, and ninety-six days in the latter for the final test. The sixth grand prize is for Music, and the competition is conducted on similar principles. It will be admitted that this system is a most severe one as regards the competitors, who must not be more than twenty-four or twenty-five years of age; the judges are the members of the Academy of the Beaux Arts, and the whole of the works of the competitors are exhibited publicly after the prizes have been awarded. A considerable number of the first artists in France have won the *Grand Prix de Rome*, but many young men have earned the same honour and never made any reputation afterwards; and there are many persons who are of opinion that these successful *tours de force*, executed under such extraordinary circumstances, are rather evidence of certain constitutional qualities of the mind and body than proofs of true artistic temperament and originality. The selection of the subject for the final test, and the fact of that subject being drawn from classic history, are among the points in the competition which find least favour; and although equitable decision would thereby be rendered infinitely more difficult, there are many persons, whose opinions deserve attention, who would leave the competitors free, not only as regards their means and methods, but also as regards the subject of their labours. But the conduct of competitive examinations in art is a most difficult question, and the only feasible method of meeting all objections would seem to be to bestow the prizes, not on those who produce the best rendering from the given subject, ~~but upon those who~~ won the highest in that and original design taken together. At present the tendency of the French school seems certainly more towards able reproduction than originality of thought and design.

Commerce.

BEET-ROOT SUGAR.—Messrs. Arnold Baruchson and Co. say that a great breadth of beet will be sown this year in France, and this is not to be wondered at, as, even in less favourable seasons than the last, the cultivation of beet remunerates the farmer far better than that of wheat, or of any other agricultural produce. Contracts for the root have already been made by the manufacturers, at equal to 15s. per ton. The production per statute acre on good land during the late season has been from 20 to 24 tons, and the manufacturer has extracted from the root from 7 to 8 per cent. of sugar. Eighteen new manufactories are now being erected in France, which will bring the number up to 437. The quantity of beet sugar manufactured up to the end of February amounted to 242,000 tons, against 141,000 at the same period last year, and 20,000 to 25,000 tons are still likely to be produced (mostly of the browner sorts), making in all between 260,000 and 270,000 tons. There remained in the entrepôts, on the 1st March, 1866, 63,000 tons, against 39,000 tons last year. The stocks of cane in all the ports were at the same time 33,000 against 34,000 in 1865, and 53,000 in 1864. In the Belgian sugar districts 80,000 tons were produced, making in all, in round numbers, 300,000 tons in the two countries. In 1855-56, 275 manufactories produced only 90,000 tons, but the constant discovery of new appliances and of improved methods enables the manufacturer

to extract a larger per-centage, and a superior quality, from the root. There has been some activity in beet sugar in the Zollverein during the past month. Parcels of strong low qualities have been purchased for the United Kingdom, and the better medium sorts for the inland refineries. The fine white crystallised sorts have been readily taken by Russia, the only country in Europe which has suffered from a deficient crop. The out-turn of the crop will be a full average, both in the Zollverein, Austria, and her possessions. The consumption, however, might keep better pace with the production, seeing the small quantity these countries consume in comparison with the United Kingdom, in which latter is absorbed per head nearly three times as much as in France, four and-a-half times as much as in the Zollverein, and sixteen times as much as in Austria. In this latter country the use of sugar last year has diminished from 3¼ lbs. to 2¾ lbs. per head. Fourteen new factories are being erected in the Zollverein. It is calculated that not less than 600,000 tons of beet sugar have been produced in Europe this season.

COAL IN CHINA.—Extensive mines of coal exist in the mountains to the north-west of Peking. It costs about 16s. per ton at the pit's mouth, and more than double this amount per ton is paid for transport to the coast; but the mines are worked in the rudest way, and the little coal that finds its way from the western ranges to Tien-tsin is conveyed on mules or camels from the mountains to Tung-chow, or the Peiho, and thence down the river in boats to this port. From the mines in the northern range there is water communication of an indifferent character to Tien-tsin, but the quality of this coal is much inferior to that which comes from the western mountains. Here, however, is a great source of wealth, only waiting the application of European skill and capital to enrich those who undertake its development. There are three descriptions of native coal to be purchased in Hankow. One known in Chinese as dry coal, is retailed at about 600 cash per picul; and that known as smoke coal is quoted at about 750 cash per picul; and a third, which is called white coal, costs about 800 cash per picul. The dry coal is a sort of coke, and is admirably adapted for all household purposes. The smoke and white coal are well suited for and employed by steamers. Hankow is furnished with coal by the Hunan coal fields, the position of which can be determined by a glance at any ordinary map. By following from its source the river (the Hsiang-Kiang) which, rising in the Hsiao Ling mountains, flows northwards until it reaches the Tung-Ting lake, the district city of Kyang, will be found situated a short distance above the point where the north-east corner of Kiangsi cuts into Hunan. Here are the mines which supply the yen mei, or smoke coal. Proceeding north we reach the great mart of Hsiang Tan, situated at the junction of two branch streams with the Hsiang-Kiang. The more westerly of these streams flows past a city marked on the map as the district city of Syang-Syang, and it is in this neighbourhood that the ku-mei, or dry coal, is produced. Further north two larger tributaries, also from the west, swell the volume of the main river; thirty miles above this embouchure they unite, and at the point of union is the district city of Fyang, close to which are the hills which yield the pai-mei, or white coal, a description of anthracite. On the Yang-tze Capt. Blakiston saw no coal until he was forty miles beyond Chang-Fu, that is to say, over 440 miles above Hunkow. According to the Chinese the coal produced in Sze-chuen and the western part of Hu Pei is inferior to that which comes from Hunan, a statement which would seem to be confirmed by the fact of Capt. Blakiston seeing at Sha Skit, about 190 miles above the outlet of the Tung-Ting lake, junks laden with Hunan coal bound upwards. Many are of opinion that coal should be found much nearer to Hankow; and during the past two years two foreign firms—one British and one American—have, with the greatest perseverance, been endeavouring to trace its existence in the Ching-kow hills, ten miles above Hankow. The British firm has recently desisted, but the American firm still continues its researches. Many of the hills between Kin-kiang and Hankow present every appearance of being rich in immense treasures, more especially that fine range which terminates eighty-five miles below Hankow, in the picturesque bluff known as the Cook's Head.

Colonies.

PROGRESS IN QUEENSLAND.—The progress made during the past year in those staple productions which must form the basis of the wealth of this colony, has been most satisfactory. Although the extension of settlement has been going on at an unprecedented and rapid rate, the wet seasons rendered the three previous seasons anything but favourable to sheep farmers, and this was seriously felt by all but the occupiers of the very best runs, both the yield of wool and the increase of stock on all the older stations of a second-rate quality being much below an average. The seasons of 1865 were such as to produce a different result, and the present wool clip is expected to be by far the larg[est] ever exported from Queensland; while the increase of sheep over the colony is also much more than in previ[ous] years, so much so, as to go far towards retrieving the position of many of the older settlers on an inf[erior] country. Some of the stations, taken up since sepa[ra]tion, have now been established long enough to parti[ci]pate in this benefit, and to give a good percentage of increase on stock. Tenders have been called for by Government, for a regular mail to and from the Gul[f of] Carpentaria, in order to provide for communication with the settlers there. The accounts from the extreme ... are very favourable; the whole of Queensland, tho[ugh a] dry season has been experienced, has escaped the dr[ought] which has been so disastrous to the new settlemen[ts in] the more northern portion of the continent. A ... trade has sprung up in the export of fat cattle ... Gladstone; and the increase of this description of st[ock] is such as to induce the erection of boiling down esta[b]lishments at various places on the northern coasts, wh[ere] the distance from any market renders this wast[eful] course advisable. On the whole, although the indebt[ed]ness of the squatters must be enormous, the past y[ear] has added very largely to the wealth of the colony in this description of property, and has added to its po[wer] of producing an income in years to come. The succ[ess] which attended the first cultivation of sugar on ... shores of Moreton Bay, has led to the occupation of a large quantity of the land for this purpose, at differ[ent] points on the seaboard, and numbers of capitalists ... now engaged in planting the sugar cane on their esta[tes] with every prospect of receiving a satisfactory ret[urn] for their enterprise.

NORTH AUSTRALIA.—The settlement at Adams Bay ... said to be a complete failure. This failure contr[asts] strongly with the rapid progress which is being made ... settlers both to the west and to the east of that count[ry.] At the head of the Gulf of Carpentaria cattle and sh[eep] are depasturing in large numbers. Squatters have fo[und] their way to good country, and are making it valu[able.] On the western coast the same process is going ... though Camden Harbour, which was an attempt ... colonization too much in the style of Adam's Bay, ... proved a failure. The mistake appears to have been ... attempting to make a colony instead of inducing on[e to] grow.

SOUTH AUSTRALIAN REVENUE.—From the Treasu[rer's] financial statement it appears that although a consi[der]able deficiency on the revenue for the year 1865 ... anticipated, there was a small balance to carry to 18... There was a net deficiency of £23,821 between the ...

mates for 1865 and the sums actually realized. The increases were under the head of public works, fees, &c. The amount of the new duties collected, and which were now in course of repayment, was £136,328. The amount of duties collected in 1865, under the head of customs duties, was £1,175,336 as against £1,098,352 in 1864. The excise revenue showed a decrease of £5,895. The sales of land by auction had produced £271,888, as £5 against £516,490. Leases under the Amended Land Act produced £116,820. The total revenue in 1865 was £,3060,265 as compared with £2,954,538 for 1864.

Obituary.

HIPPOLYTE BELLANGE. — France has lost an able painter by the death of Hippolyte Bellangé, at the age of sixty-six, and after eighteen months of suffering. He was a pupil of Gros and associate of Charlet, and first won reputation as a lithographer. When Béranger was setting all France singing the "Petit Chapeau" and the "Redingote Grise," Charlet and Bellangé were creating those clever exaggerated types of old soldiers, which tended to rouse the popular sentiment in favour of Imperialism, and to undermine the government of the restoration. People have almost forgotten Bellangé's lithographs; his works in that class have been absorbed, as it were, in those of Charlet, but his battle pieces have won for him a higher position in the world of art. Bellangé did not cover acres of canvas with rushing battalions, but was a philosophic and sentimental artist, a true painter of military episodes. One of the most remarkable of his works was a small picture exhibited about three years since, and merely entitled an "Episode,"—two brothers or friends lay dead, one killed apparently while tending the other; an ambulance party, engaged in removing the wounded, look down on the forms of the two young heroes, and even the roughest old soldier of the party is moved almost to tears. Many of Bellangé's works are in the galleries of Versailles, the Luxembourg, and the provinces, and amongst the best known are "The Return from Elba," "The Morning after Jemmapes," "The Battle of Fleurus," "The Passage of the Mincio," "The Battle of the Alma," several episodes of the Crimean and Italian campaigns, "The Cuirassiers at Waterloo," and "The Defile after the Victory," which attracted great attention at the salon last year. Bellangé won his first medal in 1824; he obtained one of the prizes at the Universal Exhibition in 1855, was made Chevalier of the Legion of Honour in 1834, and promoted to the rank of officer of that order in 1861. He painted as long as he could hold a palette, and has left a charming work, which will appear at the coming exhibition in Paris. His son, Eugène Bellangé, is following in his father's footsteps.

Notes.

SCHOLASTIC REGISTRATION ASSOCIATION.—This association has now been formed, and resolutions have been passed by the General Committee to the effect that the association consist of all schoolmasters and teachers who approve of and are willing to promote the movement in favour of Scholastic Registration, and that all who have signed in favour of registration be specially invited to become members, the contribution to be five shillings per annum. The association will meet at such times as may be appointed, to discuss important questions relating to scholastic registration, and especially to consider the provisions of the Bill before Parliament. It has been suggested that other educational questions of general interest might also, from time to time, be brought forward for discussion. The members of the association residing in any town might constitute a branch association for that town and neighbourhood, and might render valuable help in various ways, *e.g.*, by soliciting the support of their representatives in Parliament, by obtaining members for the association, and by introducing the subject of registration into local papers. The details of the constitution and proposed operations of the association will be arranged at a general meeting, to be held as soon as possible. In the mean time, the names of any masters or teachers desirous of joining the association will be received, and full information given, by the hon. secretary, Mr. Barrow Rule, 42, Queen's-square, London, W.C.

GREAT PRIZE IN VOLTAIC ELECTRICITY.—The *Moniteur* has officially published the decree, founded on a vote of the French legislature, which establishes a prize of 50,000 francs (£2,000) for a new application of the voltaic pile. This prize has already been mentioned in the *Journal*, but it will be well to make known the conditions of this scientific prize, now that the announcement is official. The prize is to be awarded to the author of a method which shall render the voltaic pile economically applicable in any of the following cases:—In industry as a source of heat; for purposes of illumination; in chemistry; in mechanics; or in practical medicine. A decree will shortly announce the conditions and the regulations of the competition. The prize is to be awarded within five years; but, should no discovery deemed worthy of it be brought forward before the termination of that period, the Emperor may, if he think fit, extend the time to ten years. By a second decree, men of science of all nations are invited to compete for the prize in question. The prize will remain open for five years from the 18th of April last. The claims of the competitors will be examined by a commission to be appointed by the Minister of Public Instruction.

Correspondence.

GAS METERS. — SIR,—After Mr. Glover's interesting paper on the national standards for measuring gas, the discussion which ensued was almost entirely a consideration of the comparative merits of wet and dry gas-meters; and this point was argued upon by engineers, by meter-manufacturers, and by consumers, each looking at the matter from his own (which in some cases was not a disinterested) point of view. There is, however, another point of view from which the subject should be considered, which is in connection with the pipes that conduct the gas to the positions where burners are required. For this purpose let it be presumed that both wet and dry meter manufacturers have succeeded in producing perfect instruments, by which all the troubles of imperfect or varying measurement, imperfect registration, or necessity for frequent repairs have been removed—Can it then be said that there is any advantage gained by using one or the other kind of meter? On this point there can be no doubt that the dry meter is much the more desirable instrument, inasmuch as the wet meter forms a convenient reservoir for water ready to be absorbed by the gas in passing through, and to be deposited in the pipes; and although the means of removal of the water so deposited is usually provided in a properly-designed arrangement of pipes, the inconveniences that arise are quite sufficient to decide the argument in favour of the dry meter, in connection with which no such deposition of water can take place except from causes that are entirely independent of the meter whether wet or dry. As this point seems to have escaped the attention of those present, you may perhaps deem it worth inserting in your *Journal*.—I am, &c., JAMES MATTHEWS.

367, Strand, 8th May.

EXPLOSIONS IN COAL MINES.—SIR,—In your excellent report of the discussion upon Mr. Hogg's paper on the

perils of mining, a slight but not unimportant error has crept in. I was reported as having said (p. 417) "that such sudden accumulation of gas as would cause loss of life can hardly take place in a short time." What I did say was, "that it is rare for such a large accumulation of gas as would destroy many lives at once to gather suddenly, and that, therefore, if warning were given of all accumulations, they would often be prevented before they became dangerous at all, and generally before they became so extensive as to destroy many miners at once." I should not like to have it supposed that I think all or most mine owners so indifferent to the safety of their men that they will neglect precautions unless compelled by law to adopt them, but certainly some are. Law, therefore, is required to make those observe the proper precautions which others more humane and more intelligent observe voluntarily. It would be no argument against the necessity for precautionary legislation, that many or even most of the coal owners do adopt all the precautions that can be reasonably expected, even were that true, so long as it is also true that many precautions usefully observed by some masters are neglected by many, as is undoubtedly the case.—I am, &c., P. H. HOLLAND.

Park-cottage, Pelham-street, S.W.

MEETINGS FOR THE ENSUING WEEK.

MON......Geographical, 8½. 1. Capt. Montgomerie, "On Yarkund and other places in Central Asia." 2. Com. Forbes, "Western Shores of Volcano Bay, Yesso."
R. United Service Inst., 8½. 1. Mr. N. J. Holmes, "On the Construction and Management of the Electric Torpedo in naval and military tactics, as applied to the destruction of ships and protection of forts."

TUES. ...Civil Engineers, 8. Discussion upon Mr. Bussell's paper, "On the Water Supply of Paris."
Statistical, 8. Major-General Balfour, "On French and English Budgets."
Anthropological, 8.
Royal Inst., 3. Prof. Ansted, "On the Application of Physical Geography and Geology to the Fine Arts."

WED. ...Pharmaceutical, 11 a.m. Annual Meeting.
R. Society of Literature, 4½.

THUR. ...Royal, 8½.
Antiquaries, 8½.
Zoological, 4.
Chemical, 8. 1. Prof. Crace Calvert and Mr. Johnson, "Action of Acids on Metals and Alloys." 2. Mr. E. Chapman, "Action of Acids on Naphthylamine." 3. Prof. Wanklyn, "Oxidation of Propione from Sodium-ethyl." 4. Prof. Wanklyn and Mr. Chapman, "Formation of Ethylamine." 5. Mr. Hadow, "On the Nitro prussides." 6. Sir R. Kane, "On some Derivatives of Acetone."
Numismatic, 7.
Royal Society Club, 6.
Royal Inst., 3. Prof. Huxley, "On Ethnology."

FRI ......Philological, 8. Annual Meeting.
Royal Inst., 8. Rev. C. Pritchard, "On the Telescope."

SAT ......Royal Inst., 3. Prof. Huxley, "On Ethnology."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st May*, 1866.

204. Wexford Convent School—Correspondence.
215. Seamen's Savings Banks—Account.

Delivered on 2nd May, 1866.

121. Bill—Veterinary Surgeons.
186. Metropolitan Local Government, &c.—First Report and Evidence.

Patents.

From Commissioners of Patents' Journal, May 4th.

GRANTS OF PROVISIONAL PROTECTION.

Axles and axle-wheels—1094—W. Y. Edwards.
Beds—1060—H. A. Bonneville.
Billiards, &c., implements used in playing—1075—G. P. Dodge.
Card cases—1074—J. H. Johnson.
Cricket—783—W. C. Fuller and J. Margetts.
Diphenylamine, preparing—1013—C. A. Girard and G. de Laire.
Disease in cattle, preventing and curing—970—E. Hilton.
Drainage—1037—C. D. Abel.
Dyed goods, printing patterns on—1063—R. B. Legge.
Earthenware—576—T. Spencer.
Engines, distributing valves for—1054—W. and W. M. Howden, and H. Heather.
Engines, slide valves and reversing gear of—1038—W. Bond.
Fibre, spinning, &c.—993—J. B. Fuller.
Fibres, washing—1032—J., J., and J. Crabtree.
Fibrous materials, washing, &c.—994—J. and W. McNaught, jun.
Fibrous substances, treating—1062—T. Gray.
Fire-arms, breech-loading—1066—J. U. Zimmermann.
Fluids, forcing—1065—J. Gresham.
Four-wheeled vehicles—1069—R. Puckering.
Hydraulic presses—624—E. Cottam.
Ice—800—O. W. Jeyes.
Lamps—1020—E. Lichtenstadt.
Lees, evaporating—1049—A. Swan.
Liquids, raising and discharging—435—J. Hargrave.
Locks—1056—T. Cooper, jun.
Looms—1069—A. V. Newton.
Lucern root, treating—1009—B. F. Weatherdon.
Matters, distilling—1092—C. M. Barker.
Minerals, cutting and getting—1091—J. G. Jones.
Motive power, obtaining—1047—S. Chatwood and J. Sturgeon.
Oxydation, protecting metal work from—1078—C. E. Brooman.
Proje tiles—1087—C. de Caesaris.
Railways, sleepers for—1061—V. S. Fombuena.
Sash fasteners—1065—J. Adams.
Ships' boats, disengaging—1081—E. R. May.
Ships, sheathing—1044—H. B. James.
Sizing machines—1070—S. Bennett.
Slag or cinder from furnaces, treatment of—1041—J. J. Bodmer.
Soap—1058—T. Gray.
Steam boilers—1059—J. Jordan.
Steam boilers, heating water supplied to—1090—J. Marshall.
Steam boilers, preventing incrustation in—1076—J. Harris.
Steam whistles—1077—W. Cuthbert.
Stereoscopes—1085—P. W. Gengembre.
Submarine electrical telegraphic wires, laying—1068—R. E. Kentland.
Subst nces, breaking—1064—S. F. Schoonmaker.
Substances, crushing—1079—C. E. Brooman.
Substances, drilling and ornamenting—1045—W. J. Cunningham.
Substances, moulding, &c.—1057—C. H. Murray and M. Jennings.
Substances, sifting—1073—J. H. Johnson.
Surfaces, producing—999—H. Wood.
Tape—1084—J. Dickinson, jun.
Telegraphic signalling apparatus—1050—T. Brittan.
Tubular or double fabrics—1083—T. Haimes.
Unfermented beverage, a new—1080—C. J. B. King.
Vertically floated paddle wheel—1012—L. M. and S. MacGeorge.
Water tuyeres—1043—E. Devey.
Weaving, looms for—1087—C. Richardson.
Yarn, warping, &c.—1095—W. Bullough.

PATENTS SEALED.

2861. R. Flude.
2870. F. Prange.
2871. H. Hides.
2876. R. Swires.
2877. C. Mole.
2879. J. A. Rainé.
2883. J. Eastwood.
2889. B. Pitt.
2893. E. Myers.
2897. T. Whitwell.
3229. C. P. Button.
349. C. D. Abel.

From Commissioners of Patents' Journal, May 8th.

PATENTS SEALED.

2890. J. E. Avy.
2896. W. Middleton.
2900. J. Norris.
2901. D. Slater.
2906. J. Millar.
2907. S. Hand and J. Slater.
2913. G. H. Goodman and E. Bow.
2915. E. Guthrie.
2918. J. Stephens.
2923. J. J. Long.
2931. T. A. Weston, J. Tangye, and R. Chapman.
2934. J. T. A. Mallet.
2959. T. J. Perry.
2961. R. A. Brooman.
2967. L. G. Speyser.
2987. W. Clark.
3010. N. Greenhalgh & J. Mallison.
3095. E. B. Wilson.
3098. G. Ash.
3171. S. Clark.
3365. J. J. and E. Harrison.
32. W. E. Newton.
45. A. V. Newton.
488. C. Mather.
556. W. Nunn and C. W. Brown.
578. W. E. Newton.
640. A. V. Newton.
684. A. V. Newton.
748. J. Macintosh.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1005. J. McF. Gray.
1132. I. M. Singer.
1124. W. Glover.
1137. A. V. Newton.
1288. W. E. Newton.
1111. J. M., E., and C. Johnson, and L. Bertling.
1127. T. Segar and J. Wilkinson.
1133. G. Davies.
1157. E. C. Bost.
1218. G. T. Bousfield.
1135. A. Sturrock.
1138. J. Park.
1146. C. A. Day, A. Lamb, and T. Summers.
1167. W. Bosler.
1267. J. T. Markall.
1126. S. B. Cochran.
1293. R. Barlow, J. Ashworth, jun., J. Newhouse, J. Hamilton, and W. Hope.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1120. J. G. Willans.

Journal of the Society of Arts.

FRIDAY, MAY 18, 1866.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at Eight o'Clock:—

MAY 23.—"On Granite Working." By GEORGE W. ...ME, Esq.

MAY 30.—"On Popular Errors concerning Australia." By the Hon. CHARLES GAVAN DUFFY.

CONVERSAZIONE.

The Council have arranged for a Conversazione on Wednesday evening, the 13th June, at the South Kensington Museum, cards for which will shortly be issued.

ANNUAL CONFERENCE.

The Fifteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards will be held on Wednesday, the 13th June, at Twelve o'clock, noon. WILLIAM HAWES, Esq., Chairman of the Council, will preside.

Secretaries of Institutions and Local Boards are requested to send, as soon as possible, the names of the Representatives appointed to attend the Conference.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the Results of the Examinations, as well as the Programme of Examinations for 1867.

Notice should be given to the Secretary of the Society of Arts of any subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Representatives of Institutions and Local Boards attending the Conference are invited to the Society's Conversazione, at the South Kensington Museum, on the evening of the same day (13th June), and will receive cards on application at the Society's House, on the day of the Conference.

Secretaries of Institutions are requested to forward, by book post, copies of the last Annual Reports of the Institutions.

CENTRAL HALL OF ARTS AND SCIENCES.

The arrangements for erecting a Great Central Hall of Arts and Sciences at Kensington, on the ground purchased out of the profits of the Exhibition of 1851, having been carried so far as to secure the erection of that building, it has been thought desirable that members of the Society of Arts should be put in possession of full information on the subject, in case they should desire to invest in the property, before the whole of the available seats are disposed of. A copy of the prospectus was, therefore, forwarded to each member with a former number of the *Journal*, and the Secretary of the Society will afford any further information on the subject if applied to.

Proceedings of the Society.

MUSICAL EDUCATION COMMITTEE.

The Committee met on Thursday, Feb. 22; 1866. Present—Henry Cole, Esq., C.B., in the Chair; Right Hon. Sir George Clerk, Bart.; Sir John E. Harington, Bart.; Colonel Scott, R.E.; Edgar A. Bowring, Esq., C.B.; and Harry Chester, Esq.

Mr. HARRY CHESTER, examined by the Committee:—

926. You are a member of this committee?—I am, and I was a member of the former committee appointed by this Society to inquire into the same subject.

927. You have been prevented from attending our meetings?—Yes; by an illness of some duration.

928. You were for many years connected with the Committee of the Privy Council on Education?—I entered the Privy Council Office in 1826, and left it at the beginning of 1860. The Committee on Education was appointed in January, 1839. I joined it, and acted as assistant-secretary for 20 years, though I was not formally appointed assistant-secretary for many years after 1839.

929. Are you familiar with the measures taken by the Committee of Council on Education to promote the teaching of music in the training colleges and elementary schools?—Yes.

930. Can you tell this committee the steps that were taken to induce training colleges to cultivate music?—The action of the Committee of Council in this matter, though limited and timid, produced extraordinary results. I will tell you what happened. Sir James P. Kay-Shuttleworth, formerly Dr. Kay, was an Assistant-Poor-law Commissioner; and in that capacity had devoted great attention, and a peculiar administrative capacity, to the improvement of the pauper schools. He was selected by the Lord President of the Council (Lord Lansdowne) and the Secretary of State for the Home Department (Lord John Russell), to act as Secretary to the new Committee of Council on Education. As soon as Parliament rose, in the summer of 1839, Dr. Kay was sent on an educational tour, to collect information, in France, Holland, and Switzerland. All persons are now aware of the immense value of music as a moral agent in education; but in those days there was scarcely any music in schools for the poor, and none whatever, except loose and rude songs, in the schools for the rich. Mr. Hickson, Miss Emily Taylor, Miss Glover, and others, among whom Mr. Turner, perhaps, had been the most successful, had done what they could to promote the introduction of singing into elementary schools. But singing, when taught at all, was too often taught only by ear. The power of singing by notes, reading music, was extremely rare even among the fashionable singers among the highest classes; no congregation, except among a few dissenters, ever joined in the psalms or hymns. A whole meeting, or a theatre full of people, joining in the National Anthem, which is now an ordinary occurrence,

was then a thing not only unknown, but impossible. Well, Dr. Kay, in his tour, was greatly struck by the prevalence of singing and its admirable influences in foreign schools. He was particularly struck by the success of Mr. Wilhem's method of teaching singing in large classes; and on returning to the Privy Council Office, he drew attention to this subject. At the very same time he heard that Mr. John Hullah had already in MS. a complete system of teaching to sing, which system he had founded on that of Mr. Wilhem, and was preparing to publish under the title of "Wilhem's Method of Teaching Singing, adapted to English use." I ought to mention, however, that though Mr. Hullah modestly gave that title to his work, it is immeasurably superior to Mr. Wilhem's, far more elaborate, systematic, and scientific. Communications having been had with Mr. Hullah, it was agreed that his work should be published "Under the sanction of the Committee of Council on Education." A publisher was soon found ready and eager to undertake the publication under such eminent and unusual auspices; and the work appeared with the seal of the Privy Council stamped on the cover, with the words, "By Authority of the Committee of Council" on the title-page, and with a "Prefatory Minute" of the Committee of Council on Education at the commencement of the work. That minute laid down authoritatively the doctrine that good instruction in vocal music was an important, if not an essential part of education; that singing by ear alone was insufficient; and that Mr. Hullah's method of teaching to sing was the right and proper method. The minute also announced that Mr. Hullah was about to open, at Exeter-hall, schools for schoolmasters, schoolmistresses, and others, where they might learn not only to sing, but to teach singing, and that these schools were "under the sanction" of their lordships. At the same time Mr. Hullah gave lessons in various schools and private classes. The first class that he taught on this method was, I think, in the Battersea village schools, under the superintendence of the vicar, the Hon. and Rev. Robert Eden, now Lord Auckland, Bishop of Bath and Wells; and the first training college in which Mr. Hullah was admitted to teach the students was also at Battersea, where the first institution of that kind was established by Dr. Kay and Mr. E. Carlton Tufnell.

930. Did the Committee of Council require vocal music to be taught in that training college?—The Committee of Council required little or nothing at that time. It confined itself very much to suggestions. We were very meek in those days, and thought it very kind in people to take our money.

931. How were the publication of Mr. Hullah's work, and the prefatory minute of the Privy Council received?—At first with a good deal of ridicule and horrible apprehension by persons of obsolete minds. I remember a worthy old Gloucestershire rector asked me if the Privy Council was gone mad, and when my lords would order the village boys and girls to be taught to dance? This good man afterwards introduced the Hullah system into his own school, and the music in his parish church was marvellously improved thereby. Some people said that those who could sing among the lower classes spent much of their time at the public-houses, and were the most dissolute fellows in the village; and that if you taught everybody to sing, the public-houses would be crammed, and there would be a general dissoluteness of morals.

932. But did all these dreadful consequences ensue?—Quite the reverse; it was the churches and chapels that became filled, and the people who mastered vocal music became dissatisfied with low and degrading amusements. The discipline of the schools became improved by the music. Mr. Hullah and his system became exceedingly popular, and my lords came in for their share of the popularity. His teaching became popular among the higher classes, and young dukes and future Chancellors of the Exchequer enrolled themselves among his pupils. He taught at Eton, Winchester, Charterhouse, and other great schools. His singing-school for schoolmasters and schoolmistresses at Exeter Hall was extended, and large classes were formed for working men and others.

933. Did the working men readily attend those classes?—Yes; in great numbers.

934. Was their conduct orderly?—Admirable. For attention, obedience to orders, perseverance, and all other good qualities of a pupil, the working men were superior to the schoolmasters and all others. I remember the first lesson that was given to 250 working men. They seemed rather shy and awkward, and there was a curious expression, half amusement and half incredulity, upon their faces. After a few preliminary observations, Mr. Hullah sang the major scale of *do*, and said to them, "Now you will just sing that scale. Every man must open his mouth well, and sing as loud as he can." A tremendous roar followed, and Mr. Hullah said afterwards that it sounded to him as if some one had pulled out all the stops of a large organ, and sat down on the keys.

935. Did they ever make better music than that?—They made excellent progress, and many of them went on, not only for months, but for years, in attendance upon these classes; and a deputation from them came to the Council office and asked to have additional evenings appointed for such instruction; for they said that since they had learned to appreciate such enjoyments, they had become disgusted with their old public-house occupations, and were desirous of something better.

936. Why did they come to the Council Office? What had you to do with it?—The classes were held at Exeter Hall, "under the sanction of the Committee of Council on Education." The lord-president, Lord Wharncliffe, took a great interest in them. We took charge of the general arrangements. There were few evenings on which one of us officers did not visit the classes. Sir James Shuttleworth, as secretary to the Committee of Council, exerted himself greatly to obtain patronage for them. He got up the great choral meetings, which were attended by the Prince Consort, the Duke of Wellington, and all the fine ladies and gentlemen of the day.

937. Did the Committee of Council on Education maintain the classes?—No: they made no grant, but they advertised Mr. Hullah and his system in a thousand ways. They encouraged schoolmasters and schoolmistresses to adopt the system in their schools, and the result was that in a short time it came into general use.

937*a*. To what do you particularly attribute this success?—First of all, to the merits of Mr. Hullah and his method, and secondly, to the active interference of Government in his behalf.

938. Do you think that this success would have been obtained without the interference of Government?—Certainly not; the action of the Committee of Council on Education was the mainspring of the success.

939. Does the Committee of Council interfere actively in the matter at the present time?—No; the Government acted with unusual wisdom in ceasing to interfere as soon as its interference ceased to be necessary. Instruction in vocal music is now accepted as an essential part of education, both in training schools and elementary schools.

940. How were those classes at Exeter Hall maintained in funds?—There were a few subscribers; the choral meetings produced some profit; but the main sources of supply were the fees paid by the pupils.

941. Have you had any experience yourself of the advantages of music to the lower classes of the people?—I have already adverted to the case of the working men who attended Mr. Hullah's classes at Exeter Hall. My connection with the educational schemes of the Privy Council and of the Society of Arts has given me a very extensive experience of the condition of the working classes in Great Britain during the last 27 years. The improvement is extraordinary, as you all very well know. It has arisen from a great variety of causes; but I do not hesitate to express a conviction that the wide spreading of music in that period is not only one of the effects, but

also one of the efficient causes of that improvement. The spread of instruction in vocal music has naturally led to a desire for instruction in instrumental music. The committee is aware how many schools have now not only their singing classes, but their bands of wind and stringed instruments. A curious circumstance occurred at Liverpool some years ago. A district pauper school was established in a suburb of the town. The Government inspector took great interest in it, and it was well managed. The pauper boys were taught to sing, and many of them were taught to play on wind and stringed instruments. They had a capital band of their own, those pauper boys. After awhile the ratepayers of Liverpool began to cry out against the expense of this school. "You are over-educating the people," they said; "What have paupers to do with music?" The Board of Guardians had half a mind to suppress the school, or rather to deprive it of all its excellent distinctive characters, and to reduce it to the ordinary standard of an old-fashioned pauper school, *i.e.*, a school of pauperism. The friends, however, of this valuable institution caused the children to march with their band through all the principal streets of Liverpool, one Saturday afternoon, just before the day when a meeting was to be held to determine whether the institution should continue to be supported or not. The passage of the children through the town struck the townspeople with astonishment. The appearance of those poor little paupers was wonderfully improved. The band played so well that it excited quite a *furore* of admiration and interest, and the school was saved.

942. Who paid Mr. Hullah for his services?—He was popularly supposed to be paid by the Government, but that is a mistake. He received no grant from my lords, but their patronage and active support promoted the sale of his books, advertized him in the most effectual manner possible, and increased the number of his pupils in his private and public classes to an extent that would scarcely have been possible under other circumstances.

943. The great point is whether the Committee of Council would be likely to support any direct movement for promoting music?—The Committee of Council would make no such grant without a special vote from Parliament.

944. The arrangements that were made in favour of Mr. Hullah are not now in existence?—They are not, and have not been for some years. The object was to make the system well known at the outset, and to give an impetus to the introduction of vocal music as an essential part of elementary education.

945. Is it within your experience that the cultivation of music has increased in this country?—Yes; even more among the higher classes than the lower; but at the same time very extensively among the lower classes.

946. And you think, within certain bounds, music should form part of the education of every child?—Certainly; of every child in every class of society.

947. And the result would be that a great amount of musical aptitude would be developed that might be turned to good account if a good general system of musical education were devised?—No doubt, under a general system of musical instruction, the mass of the people might not only be taught to sing in their families and at church, but great numbers would be found capable of learning to play respectably on one or more instruments, and all those who had a real musical aptitude would show themselves, and they could have their powers cultivated to the great advantage of the country.

948. You think it a justifiable public expenditure to take some trouble in obtaining such a result?—So far as it is right for government to interfere with education at all, I think it right for government to interfere for the purpose of promoting instruction in music.

949. You think it justifiable?—Under certain limitations and conditions, not only justifiable, but highly desirable.

950. Do you think you could have the proper amount and degree of instruction apart from central agency?—No. I think that some central agency would be quite necessary, and that the government must give liberal grants to establish and for some years to help in maintaining that agency; but the permanent control of any educational agency by a government department I hold to be a great evil, and to have a crippling effect.

951. What control do you allude to?—Such a control, for example, as the Committee of Council now exercises over the training schools and elementary schools under inspection. That control is absolute, because the Committee of Council hold the purse. What is called "inspection" is virtually "control."

952. Control applied to the matters of reading, writing, and arithmetic; is there anything to control, except that if the state chooses to aid it, it has to see that a proper amount of it is given in return?—If schools were merely places for reading, writing, and summing, it would signify little who exercised control there. Parliament does right in insisting that all should learn those things; but there are various methods of teaching reading, writing, and arithmetic, and evil ensues when an official personage is allowed to require that these should be taught everywhere on the one uniform system which he may chance to prefer; and they form, after all, but a very small part of the education of a good school. When the government grants aid to a school upon an inspector's report, depend on it that the inspector is the real ruler of the school.

953. If government contributes its aid to promote the elementary branches of reading, writing, and arithmetic, you would not complain of a small sum being appropriated to the encouragement of music?—Far from complaining of that, I am very anxious that it should be done. I should like the government to appropriate a considerable sum for the encouragement of music. I think it an object which the government might with great advantage take up at the present time; only I do not wish the government to interfere in the matter too minutely or too long.

954. You are aware of the existence of the Royal Academy of Music?—I am.

955. You would think it no great sin against political economy or constitutional principles if the government gave a little more pecuniary aid, under proper conditions, to the encouragement of music in this country?—I think it might do so with great advantage.

956. You think a wider distribution of musical knowledge and ability would improve church music, and is also calculated to improve the morals of the people, by affording them a means of innocent recreation?—Yes, undoubtedly.

957. Do you think it possible that an efficient central establishment could be maintained in this country on self-supporting principles only?—I think it could neither be created in the first instance, nor maintained for some time after its creation, without assistance from public funds. With such assistance rendered at first it might ultimately become self-supporting.

258. There is this peculiarity in musical education which must be considered—that you may find a vast deal of musical aptitude in the possession of extremely ignorant and poor people?—Certainly.

959. Who are not able to appreciate its value, and have not the means of cultivating it?—Just so.

960. And therefore, unless public benevolence, in the form of Parliamentary grants, steps in in aid, all that musical labour is lost to the country?—That follows to a certain extent, from my premises. I only mean to say that while the government is empowered by Parliament to do what is really necessary to establish music on a suitable scale, and to enable it to maintain itself ultimately by payments from pupils and similar sources, and private benevolence, it should withdraw its interference as soon and as much as possible. The government grant is a go-cart for a small child, to be withdrawn as soon as it can walk.

961. Private benevolence, in such cases, is always very precarious?—Yes; but public aid might perhaps be more so.

962. You mean Parliamentary benevolence?—Yes; certainly.

963. You think that Parliamentary good-will to such institutions is not permanent?—I think that Parliamentary difficulties have been, of late years, the great difficulties in the way of the improvement of the institutions for the promotion of science and art. For instance, nearly all the difficulties in the way of the improvement of the British Museum and the National Gallery of Art are difficulties which have their origin in Parliament, through the apathy of some parties, the jealousies of others, and the sciolism of nearly all.

964. You think government would be willing to do what is wanted, but that Parliament will not let them?—I am not prepared to say that any government is willing to do all that is wanted for the improvement of these institutions; but I think that the general disinclination on the part of all governments to bring any important or extensive scheme of improvement before Parliament is a natural result of the fact that Parliament is a very difficult body to deal with in relation to such subjects.

965. You would not object to seeing the Parliamentary vote of £500 extended?—I see no good in increasing the grant unless you improve the system. If you reformed the Academy on an extended and improved plan, I think it would be very right to make an extended grant.

966. And being extended, there ought to be a body responsible to government for the proper administration of the grant?—There should be a responsible management, even if the grant is not extended; but much more so if it is extended. My idea is that, having got a good plan for the reconstitution of the Royal Academy, as a national institution, on a scale worthy of the nation and of the great importance of music, a large Parliamentary grant should be made towards the provision of a suitable building, and towards the other requisite initial expenses; and that the necessary annual grants, to be subsequently made, should be made on an expiring scale, *i.e.* that they should be lowered every year, as support from other sources comes in, with a view to the ultimate independence and self-support of the institution. The reductions should be judiciously and gradually made, till the institution is able to go alone.

967. Do you not think an institution like the Royal Academy of Music, to serve the purposes of the whole country, must have some central supervision and responsibility attached to it?—Whenever the public money is granted to an institution, central or local, the government which makes the grant must have the means of controlling the application of the Parliamentary funds.

968. Do you think a Royal Academy of Music could continue to exist without some central control, which must be that of the government?—Do you ask me whether I think the Royal Academy can exist without some connection with the government?

969. Yes?—I think it could not pass through its infancy on a proper scale without assistance; but I do not think that it must always be dependent upon the pecuniary aid of the government.

970. We have a Royal Academy which for the last quarter of a century has existed until the last few years by balling, dancing, and music, and by all possible auxiliaries, accompanied by the fees of the students. At last Parliament has been induced to give a very small grant. It is considered desirable to enlarge the sphere of this academy. Do you not think the experience of the last fifty years is sufficient to prove that such an institution cannot be maintained without some aid from the state?—I think it has been shown that such an institution cannot be maintained without aid from the state; but a better institution might ultimately, though not for perhaps a long term of years, become independent of that aid. The past failure seems to be in a great measure owing to the very limited and contracted scale on which the Royal Academy of Music has been carried on.

971. Somebody must pay for it; it must be paid fo either by those who do not appreciate music, or by those who do appreciate it in the concrete sense—by Parliament for instance?—You do not mean to say that Parliamen is the best judge of music and musical affairs.

972. Do you think the experience of other cities i Europe seems to prove that you must have funds deriv from government efficiently to support a national insti tion for the cultivation of music?—I am not prepared admit that. The whole system in foreign countries is different to our own that the analogy does not hold.

973. To do a thing well you must pay well for it. good Royal Academy requires a good deal of money support it. Every conceivable method of obtaining port from private sources has been tried and failed: sequently, if the country thinks it desirable to have a g Royal Academy, it cannot be had without the governm in some way contributing to its support?—I entirely ag in your conclusion. I am clearly of opinion that a considerable grant from Parliament is necessary for establishment and maintenance of a sufficient Academy of Music.

974. Especially as regards scholarships?—Yes. establishment of scholarships is a form of aid which advantageously be granted by Parliament.

975. Is it your opinion that Oxford, Cambridge, Harrow, and other public establishments would be they are unless they had been liberally endowed?— course they would not be what they are. They wou different; but some people think, and I am not sure they are wrong, that these great institutions might been more vigorous and progressive if, not being qu liberally endowed, they had depended a little mo public opinion for support. The endowment pr seems to me to be the opposite of that which I unde you to desire; because endowment, as the word i monly understood, tends to stereotype the endowe tution, and to prevent responsibility to public o but I agree with you that Parliament ought to funds for establishing, and to a considerable exte towards maintaining, a worthy Royal Academy of and that an institution thus aided ought to be sub a certain degree of control from a minister respon Parliament.

976. From your extensive connection with the tion question and kindred subjects you must hav opinion whether the greater promotion of musical tion is really an important national object such government ought to take up?—I am fully convince it is so. I have no doubt that the rapid growth of in this country since 1839 has improved the mora increased the happiness of the people. It has als a most noticeable effect in improving the services church and increasing the congregations. It has powerful assistant in education—the education of all of society. If you take a hundred musical where the sons and daughters are musical, and one h non-musical families, where none or few of the understand or care about music, I feel confident will find the sum of happiness much larger in the than in the latter; and you may apply the like nations. Increase the number of musical families you increase the number of happy families in the Where there is a more general cultivation of there you will find more innocence and more purity and refinement, because there music the vacant time which would otherwise too often in sheer helplessness, to inferior and debasing There is no want of musical aptitude in there is a great want of musical education; all that is wanted to bring back to England her fame as a land of music. "Merry" England England, and I hope your efforts may help England "merry" again.

Mr. TURLE examined by the committee:—

977. You have been for many years organist of Westminster Abbey?—I have.

978. For how many years?—Thirty-four years.

979. Of how many members does your choir consist?—Sixteen boys and twelve men—vicars-choral.

980. What steps do you take to keep up your supply of boys?—The children are generally introduced to me by their parents. They are strangers to me. Of course there is an idea that there are certain benefits accruing to them by their introduction to the choir. I first try their voices, and if they have voice and ear, and are in other respects qualified, I put them on my list as probationary boys, and when vacancies occur they fill them.

981. Then having admitted them into the choir what do you do with them?—They attend the service twice daily. There is a school provided for them, which they at-attend, and where they receive a purely English education.

982. Is their education also probationary?—No.

983. Are the boys boarded and lodged in the school?—No; they live with their parents, I am sorry to say. I wish to see them boarded.

984. They merely attend the school as choristers?—Yes.

985. What other instruction is given besides musical?—Instruction of the National School kind. There is a regular schoolmaster; I have no connection with the school myself.

986. When a boy's voice breaks, and he is ineligible to remain in the choir any longer, what becomes of him?—If he has musical talent (and many of them have), he often follows the musical profession. In several cases, to my knowledge, former choristers have obtained appointments as organists in London and in the provinces.

987. Do you find any instances of their returning to the choir as full voices?—Very few indeed.

988. Do you consider there is a want of some instruction to which such musical talent as you have knowledge of might apply, and where it might be cultivated?—I think so.

989. Have you any knowledge of cases in which any of the choristers on leaving your choir have gone to the Royal Academy of Music?—Yes; I have known one such case; one, who was a very good singer, went to the Academy. I should say at once that I do not teach them to play—only singing; but while they have the advantage of attending daily with me, and seeing how the duties are performed, they are really improving themselves, though I do not sit down to the instrument with them.

990. So far as you know, it is not the practice of the choristers to go to the Royal Academy after leaving your choir?—At present I only recollect that one instance. He was a very clever youth, a good musician, and a good singer.

991. If means were provided for admitting into the Academy promising youths from the choirs, you think it would be an advantage?—I think so certainly.

992. And have a beneficial effect upon the choristers themselves?—I think it would be an incentive to the boys if they knew there was such a provision.

993. And your choir eventually would be all the better?—I think so.

994. Have you reason to believe that the same method of recruiting the choirs prevails in the other cathedrals throughout the country?—Yes, I believe so.

995. There are no systematic means of obtaining choristers, but they come forward hap-hazard?—Sometimes they are introduced by boys who are leaving.

996. From what class in life do they generally come?—Very varied, indeed. Some are children of mercantile and other clerks, and tradesmen.

997. Of what age are they when they come to you?—I like to get them from seven to eight years of age.

998. What remuneration do they receive?—Four seniors, 13 guineas each per annum; four juniors, £9 2s. each per annum; four juniors of the second class, £8 each per annum. Each of these twelve boys has besides a guinea at Easter for livery. The whole sum now paid to them is somewhat over £135. The four supernumeraries receive nothing but their education.

999. What is the school to which they go? What is it called?—A school erected some years since by Dean Buckland, and called the Choristers' School. The education given there is of a very inferior description to that which was originally intended by the statutes.

1000. Does it belong to the Abbey?—Yes, it was erected by Dean Buckland; before that the choristers of the Abbey were entitled to the advantages of Westminster School. Now they no longer go to Westminster School, but have only the school which I have mentioned. It is only fair to add that parents but rarely availed themselves of the right of sending their sons to Westminster School; but, as the existence of the right became known, it certainly had the effect of inducing a superior class of people to bring their sons as choristers.

1001. Do the Dean and Chapter pay for the education?—The sacrist, by virtue of his office, is required to teach the boys.

1002. How many are there to be taught?—Sixteen.

1003. That is a school in connection with the Church of England?—Oh, yes. It belongs to the Abbey.

1004. Children of Dissenters not being admitted?—No; the boys are required to bring their baptismal certificates to me.

1005. Do you know at all what was the practice in ancient times in these matters?—The choristers were to be educated in Westminster School, and in the elections to the Universities, which take place yearly, they were, *cæteris paribus*, to have the preference. The Committee will find the subject fully entered into in my evidence given before the Royal Commissioners who were appointed to inquire into the management of certain colleges and schools. I cannot refrain from here stating that, with the above-mentioned great advantages secured by the statutes, it always has seemed to me a peculiar hardship to the Westminster choristers that between 14 and 16—their voices break about that age—they should be sent adrift on the world and left to shift for themselves, their education being necessarily most imperfect.

1006. Should you be surprised to learn that in Henry the Eighth's time every cathedral church was bound to have its teacher of music for the choir, who were also educated at the expense of an ecclesiastical fund for the purpose?—No, for I believe that regulations similar to those required to be enforced by the Westminster statutes prevailed elsewhere. I would instance Magdalen College, Oxford, to which, by reason of a good classical education being given, together with the prospect of scholarships in the University, professional men are induced to send their sons as choristers.

1007. Are they educated free of expense at Westminster?—Yes; in the choristers' school.

1008. That has practically the effect of limiting the class from which the choir is selected?—Yes; the style of education is only suited to an inferior class.

1009. It appears that in some instances members of the choir, instead of continuing the study of music, have become artists in painting?—Yes; there have been some such instances.

1010. Have you any suggestions to make to the committee for the practical improvement of Church music?—No; I think that the suggestions which were made by Mr. Kellow Pye were very good. I think that if the Deans and Chapters would unite to support his proposition, the effect on Church music could not be otherwise than good.

1011. The letter to which you allude stated that the Royal Academy of Music had resolved to offer to the Deans and Chapters of cathedrals musical education on reduced terms to choristers, who, on leaving the choirs, might be possessed of musical talent, and wished to follow the profession of music, especially that branch connected with Church service?—Yes.

1012. You think if something of that kind were established, it would benefit music generally and cathedral choirs in particular?—I think it would benefit Church music, which, for many generations, for want of encouragement in the proper quarters, has not, I consider, improved like other branches of the art.

1013. Are the boys of your choir instructed in the science of music generally or not?—They are all taught singing thoroughly—to some of them I am teaching harmony of my own accord.

1014. They are taught to read music well?—They can read any music, and I generally practice them from score, and in that way they learn the clefs; I think by that means a choir may be brought to great efficiency.

1015. Do you think Church music in its performance has improved or otherwise of late years?—I think it has very much improved.

1016. To what cause do you attribute the improvement?—I attribute it mainly to the more general diffusion of musical knowledge.

1017. The public demand is more exacting?—Yes; and I think public taste is very much improved.

1018. What is your opinion of the sufficiency or otherwise of the Royal Academy of Music, as at present carried out, as representing the musical education of the country?—I do not think I am able or entitled to answer that question, for I have never been inside the walls of the Academy. I do not know what the system there is, but from all I have heard I should say there is room for extensive improvement.

1019. How does your own choir compare with that of St. Paul's as to numbers?—I think it is larger.

1020. And more efficient?—From what I have heard, perhaps more efficient.

1021. Has it always been so?—Always since my recollection. I believe St. Paul's has improved very much within the last ten or fifteen years.

1022. Have you found of late years the congregation evince a greater interest in the musical services?—Yes.

1023. And take part in them?—They join in the responses.

1024. Do the boys of Westminster School take part in the chants?—No.

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—The Central Committee of this Union announce that in consequence of the unexpected death of their much-lamented and highly-esteemed agent, Mr. Barnett Blake, they have been under the necessity of appointing another gentleman to fill that office. From a considerable number of candidates, many of them gentlemen of high ability, they have selected Mr. Henry H. Sales, Secretary of the Metropolitan Association for Promoting the Education of Adults, the objects of which body are in many respects identical with those of the Yorkshire Union. Mr. Sales has also recently filled the position of Organising Agent to the Kent Association of Institutes.—The next annual meeting of the representatives of the Mechanics' and Literary Institutions of Yorkshire will be held in the Mechanics' Institution, Halifax, on Wednesday, 23rd May. The morning meeting will commence at eleven o'clock, Edward Baines, Esq., M.P., President of the Union, in the chair. At the evening meeting the Hon. and Rev. Lord Sydney Godolphin Osborne will preside. Arrangements are being made by the Halifax Institution Committee for visiting several important manufactories, the Orphanage, and other objects of interest on the following day.

PARIS EXHIBITION OF 1867.—ALLOTMENT OF SPACE.

The Lords of the Committee of Council on Education have had under consideration the best means of apportioning among intending exhibitors at Paris the spac[e] placed at their disposal by the French Imperial Commis[-]sion. Their Lordships have received demands in th[e] United Kingdom amounting in the aggregate to mor[e] than 300,000 superficial feet of net horizontal exhibitin[g] space; whilst the space placed at their disposal by th[e] Imperial Commission amounts to about 70,000 superfici[al] feet of net space, which is partitioned into groups by th[e] Imperial Commission, thereby leaving a more limite[d] scope of adjustment within the powers of the Briti[sh] Executive than in 1855. Their Lordships consider th[at] it is beyond the competence of the British Executive [to] undertake the sub-division of this space among exhi[-]bitors, and, as in the Paris Exhibition of 1855 and oth[er] International Exhibitions, each local committee has be[en] invested with power to allot such space as may [be] thought right to each exhibitor, or to reject the deman[d] of any exhibitor or exhibitors, or to apply the wh[ole] space placed at its disposal to a collective representati[on] of the staple industry of the locality. The local com[-]mittees of the United Kingdom will allot space only [in] respect of local manufactures, as separate committees ha[ve] been requested to deal with the demands in the oth[er] sections of the Exhibition, as follows:—

For Architecture and the Arts cognate thereto.—T[he] Committee of the Royal Institute of Architects.

Machinery.—The Council of the Institution of C[ivil] Engineers.

Agricultural Implements and Live Stock.—A joint co[m-]mittee consisting of members of the Royal Agricultu[ral] Society of England, the Highland Society, and [the] Royal Agricultural Society of Ireland.

Horticulture.—The Royal Horticultural Society.

Photography.—The Photographic Society.

Manufactures (Metropolis).—The Associate Committ[ees] of the Metropolis for particular classes.

The meetings of the metropolitan committees fo[r] allotment of space among the London exhibito[rs] now taking place at the House of the Society of [Arts]. Meetings in connection with classes 6, 7, 8, 14, 1[-] 22, 23, and 36 have already taken place, and sub[-com]mittees have been appointed who are now engag[ed] dividing amongst the claimants the space placed a[t the] disposal of each class.

The Secretary of the Society of Arts is actin[g] secretary of these committees.

THE LAW OF BANKRUPTCY.

The following is from the *Pall-Mall Gazette*:—

The whole question of the bankruptcy law is [...] opened up by the Government Bill which was rec[ently] introduced. On a former occasion we pointed [out] that the present law of bankruptcy is a system by w[hich] as soon as a man becomes unable to pay his deb[ts he] may free himself from his liability to do so, his cre[ditors] either taking the collection of his assets into their [own] hands, or employing legal machinery for that pur[pose]; and we further observed that all the difficulties [con-]nected with the establishment of a proper system [may] be solved by answering the following questions:—[Why] should a man ever be freed from the obligation of [ful-]filling his contracts? Why, if he is, should his cre[ditors] be formed into a sort of corporate body for the p[urpose] of making terms, the resolutions of the majority b[inding] the minority? Why, when he cannot pay his [debts], should there be a judicial and quasi-criminal in[quiry] into his affairs? We will try to give some [sort of] answer to each of these questions, proceeding alw[ays on] the assumption that the remedies of a creditor are [con-]fined to taking the property of his debtor, and are [not] to extend to imprisoning his person.

As to the first question, the answer usually [given] is, that a man ought to be freed from the [obli-]gation of paying his debts, because if he is [not,] his liabilities will hang over him indefinitely

paralyse his future exertions, which is against public policy. There is a great deal of nonsense in this. No one is more interested in a debtor's future prosperity than his creditors; and as they are neither fools nor savages, they will be perfectly well able to understand this, and will probably be willing to act upon it. It is an absurd mistake to suppose that a creditor is a sort of wild beast, who passes all his time in lurking about and seeing whether he cannot squeeze a few pounds more out of his debtor. As a rule, he is far too much occupied to do anything of the kind, and, if once satisfied that his debt cannot be paid, is perfectly content either to take a composition or to go without it. An insane delight in bringing actions against penniless defendants is like a taste for shearing pigs. When you cannot take a man in execution, and he has got no goods, what use is there in getting judgment against him? If a man is subjected to no cruel consequences for being in debt, there is really no hardship at all in making him stand to his contracts. Indeed, to do so is only giving every man his own. If I lend you money, the money does not cease to be mine in morals and common sense because you have the use of it.

It is not therefore out of consideration to the debtor that we require any modification of the rule that contracts should be fulfilled. It is required for the protection of one creditor against another. It is obvious that fraud would be much promoted and credit greatly hampered if, when a man was insolvent, the rule of first come first served were indiscriminately applied; so that the first creditor who sued or demanded payment should be paid in full, and the rest not at all. The object of bankruptcy legislation ought to be to induce persons who cannot pay their debts to disclose the real state of affairs to their creditors at the earliest possible moment. If a man did pay 20s. in the £1 at the last moment at which he could pay it, he alone would suffer, and every one else would get his own. If, knowing himself to be insolvent, he carries on trade for a single day, he is in fact stealing his creditor's money to that extent; and the only rational ground upon which the obligation of contracts can be retained is that of offering inducements to debtors to abstain from such a course of conduct. The way to do this would be difficult. It might be provided that any person who found himself unable to meet his engagements might declare himself insolvent, and that if he were able to pay his creditors, say 15s. in the £1, he should thereupon be freed from all further liability; but that if he were not able to pay 15s. in the £1, he should be freed from his liabilities only if his insolvency arose from inevitable misfortunes, and if the fact was disclosed as soon as he became aware of it, the proof of which facts should lie upon him. The effect of a provision conceived in this spirit would be that there would be a strong inducement to debtors to declare themselves bankrupt at the very first moment at which the fact that they were bankrupt came to their knowledge, for this would be the only means by which they could get rid of their debts. The creditors, on the other hand, would be secured against fraud to any serious extent by the provision as to the amount of dividend, and as to the burden of proof if inevitable misfortune were urged as an excuse for not paying it. If a person was suspected to be insolvent, and if he could be shown to have done anything which afforded strong evidence of insolvency—*i.e.*, if, in technical language, he had committed an act of bankruptcy—any creditor should have the right of having his property seized and rateably distributed. But in this case there is no reason why the debtor should be freed from liability, or why a majority of creditors should bind a minority as to the terms which might be accepted. So far the general result of a reasonable system will be as follows:—Persons in insolvent circumstances would be under a strong inducement to proclaim their insolvency as soon as they knew it, and if they did so before their creditors had incurred serious loss, or if their insolvency arose from unavoidable accident, they must be freed from their liabilities. If they did not make known the fact, but improperly concealed it, the creditors would be able to have their assets divided, and the liability would continue and attach to after-acquired property. The only machinery required to work such a scheme would be the appointment of persons able to get in the debts and realise the property of the bankrupt, and this ought to be no difficult matter. An official assignee, paid by a percentage on the amount recovered, would be the only person required, and a judicial investigation of the accounts would not be necessary.

This would be the commercial part of a reasonable system of bankruptcy. The judicial part would be altogether independent of it.

In the first place, a special tribunal would be required, to which in case of need, and only in case of need, the creditors might resort in order to make the assignee do his duty, or to solve legal questions which might arise in the course of its discharge; but in ordinary cases there would be no reason why a case of bankruptcy should come into court at all except for the sake of a formal adjudication or declaration of bankruptcy.

In the second place, it would be necessary to extend very much the provisions of the criminal law as to fraud. As matters now stand, almost the only form of theft which can be legally punished is picking pockets, or something equally clumsy. The more refined forms of fraud go altogether unpunished, though they are quite as wicked and ten times more injurious to the public. If it were once clearly understood that the moral guilt of risking the money of other people without their leave is much the same as that of theft, and if the law, as it ought, were made to conform to morality, a reform of inestimable importance, both in morals and in law, would be brought about. *Primâ facie*, a man who cannot pay what he borrows is a thief, and ought to be treated as such. He deserves imprisonment and hard labour as much as if he stole a watch, unless he can show that his inability to pay arose from misfortune; and that is a matter which, as it lies peculiarly within his own knowledge, he ought to be able to prove. The old law of debtor and creditor did in a stupid, cruel, and purblind way recognise this great fact. It visited the debtor with terrible severity, but it did so in an indiscriminating, irrational manner, for it enabled the creditor to imprison a man for life who might be merely unfortunate, whilst it did not enable the regular courts of law to imprison him for a reasonable time if he were ever so fraudulent or reckless with the money of other people. Of course we do not suggest that so sweeping a proposition as the one laid down above should be made into law without a great deal of adjustment and qualification, but that is the principle on which legislation should be founded. Nothing is vaguer than the notions of lawyers about fraud. The word is continually in their mouths, and it has as many and as technical meanings as the word "malice;" but they never yet have grasped the principle that not to pay a debt is a fraud, and ought to be a crime unless the debtor has a just excuse, and that carelessness, reckless trading, and gross folly or rashness are not excuses. If the law were well leavened with this principle, it would work a great reformation in trade and in morals.

Fine Arts.

PARIS ANNUAL EXHIBITION OF WORKS OF ART.—The annual exhibition of the works of living artists opened as usual on the first of May. The annual exhibition, or *Salon* as it is called, represents fairly enough not only the condition but the extent of the cultivation of art in France. The catalogue of the Salon includes 3,297 works of all kinds, viz.:—1,998 paintings in oil, 616 water-colour and other drawings, miniatures, enamels,

paintings on glass, china, cartoons, &c.; 390 pieces of sculpture and modelling, 75 sets of architectural designs and studies, 172 works in engraving, and 46 in lithography. In addition to this immense collection, which fills sixteen rooms, some very large, and none of them small, there is another room appropriated now, for the first time, to the exhibition of the works of pupils who gained the grand prizes for Rome last year, and of those sent home by prizemen at the French Academy in Rome, making an addition of 41 works, and a gross total of 3,338 in all; and this is smaller by about 300 than it was last year, without the works of the schools. It cannot be said that the exhibition of this year is a remarkable one for Paris; several eminent artists are missing, Cabanel, Pils, and Meissonier amongst the number, and the works exhibited by Gêrome, Hebert, Hamon, Moreau, and others, can scarcely be said to sustain their high reputation. The Cleopatra of the first artist is an ambitious and remarkable, but not a great work; M. Hamon has but just fallen short of his highest achievement; his subject is admirable, "The Muses mourning over the destruction of Pompeii;" the conception of all the figures is excellent, but the tone of the whole, as a work of art, is not quite satisfactory. While the generally excellent drawing and careful manipulation of the French school are as conspicuous as ever, there is, unfortunately, no apparent progress towards improved sentiment and higher aspiration. But there is a grand field for study and many improvements of a secondary character to be remarked. In the first place, there is certainly an evident advance with respect to colour, and more proofs of observation; less conventionality and more nature. The comparison of the works of artists who obtained medals a few years since here with those of younger men not yet or only recently so honoured, is certainly not unfavourable to the latter. The number of portraits is considerably diminished; the official pictures are few in number; the battle pieces are far less numerous, and, it must be added, not better than usual; and the landscapes, as a rule, are more natural and far better in colour. Among the pictures which attract the greatest amount of attention, besides those already named, are—"Warsaw in 1861," by the son of M. Robert-Fleury; "Marguerite Trying on the Jewels," by a young artist named Merle; two female studies, "A Fellah Woman of Asia Minor," and "An Armenian of the Caucasus," by M. Landelle; "Deer in a Forest," by Courbet; four charming "Landscapes," by Fromentin and Rousseau; and the last two works of the late Hippolyte Bellangé, "The Wounded Cuirassier," and "The Old Guard at Waterloo." The sculpture does not appear to present any very remarkable work, and being placed this year beneath the gallery, instead of in the garden or central portion of the ground-floor, is not seen to advantage. Another change has been made with respect to the prizes; heretofore the two Medals of Honour have been left to the juries, but this year they are to be voted by the whole body of decorated artists and all who have received first-class medals. These two great prizes may be given in any section, and even both in one section; but the general opinion is that they will not be awarded this year. The conditions are—that of the 505 artists qualified to vote, one-third must take part in the election; and to be successful the artists proposed must have an absolute majority of the votes registered. The exhibition will remain open until the 20th of June, with the exception of four days, commencing with the 28th May. During this short interval some modifications will be made in the arrangement of the pictures, and the awards will be marked on the successful works.

Manufactures.

New Method of Sugar Refining.—It is well known (say Messrs. Travers) that Peligot proposed the employment of his observation on the insolubility of the compound of lime with cane sugar, for the production of th[e] substance from molasses. In some experiments on small scale he extracted twenty-five per cent. of cry[s]tallizable sugar from beetroot molasses. In the sug[ar] refinery of Schröter and Wellman, of Berlin, this meth[od] of Peligot's is being carried out on a large scale. Th[e] molasses is mixed with the requisite quantity of hydr[ate] of lime and alcohol in a large vat, and intimately stirr[ed] for more than half-an-hour. The lime compound [of] sugar which separates, is then strained off, pressed, a[nd] washed with spirit. All the alcohol used in the proc[ess] is afterwards recovered by distillation. The mud[dy] precipitate thus produced is mixed with water, and d[e]composed with a current of carbonic acid, which [is] effected in somewhat less than half an hour. The ca[r]bonate of lime is removed by filtration, and the cl[ear] liquid, containing the sugar, evaporated, decolori[zed] with animal charcoal, and crystallized in the u[sual] manner. The sugar furnished by this method has a v[ery] clear appearance, and is perfectly crystalline. It conta[ins] according to polarization analysis, sixty-six per cent. [of] sugar, twelve per cent. of water, the remainder being [un]crystallizable organic matter and salts. The yield, [of] course, varies with the degree and richness of the r[aw] material; on an average 30lbs. of sugar were obta[ined] from 100lbs. of molasses.

Sugar Boiling.—The *Trinidad Chronicle* quotes [a] letter from the *New Orleans Bee*, giving an account o[f] beneficial employment of non-metallic vessels for sug[ar] boiling, as follows:—"The action of copper or iro[n is] well-known to be injurious to sugar, and even in st[eam] boiling it is manifested. Many efforts have been m[ade] to get non-metallic vessels, but hitherto all have fa[iled]. It has been recently discovered how vessels of fire-[clay] can be made to stand intense heat, and replies from [the] Patent Office at Washington are awaited before p[utting] the matter before the chemical world."

Commerce.

Chefoo.—Peas are largely imported in junks [from] Nin-chwang, and are then transhipped on board fo[reign] vessels for conveyance to the southern ports, C[anton] (through Hong-kong) taking the largest qu[antity]. When these peas are crushed into cakes (bean c[ake]) they are exported to Swatow, at which port th[ey are] used as manure for the sugar crops. The n[umber] of mills employed in the manufacture of these ca[kes is] considerable. The process is slow and simple. A [large] stone (to a pole passing through the centre of w[hich] a mule is harnessed) crushes the peas as it [passes] round a circular narrow causeway, into which they [have] been thrown. These, in this crushed condition, [are] packed in moulds, and placed in a press, whence [they] are extracted free of the oil, which has passed in[to a] receptacle prepared for it.

Persian Opium.—Opium is produced at Meshed, [and] is exported to Bokhara and Khokand. The opium [pro]duced at Yezd is said to be of excellent quality, b[ut ex]porters have of late so adulterated it that it is s[aid the] whole quantity which has lately been sent to China [will] probably be returned. A French gentleman w[as sent] last year to make inquiries as to the quantity of [opium] produced in Persia, with a view to supplying [the] hospitals in France. He expressed himself [well] satisfied with the result of his investigation, [having] found the best Persian opium to contain as much [as] per cent. of morphine, but that it would be necess[ary to] take great precautions in purchasing to prevent adul[tera]tion.

The American Cotton Crop.—A New Orleans [pa]per, in estimating the probable cotton crop of the p[resent] year, calculates that of negro cotton raisers there [are] about 285,000, of whom 75,000 are men, 150,000 wo[men], and 60,000 boys and girls. The writer goes on to say,

think that it would be a large estimate to allow 200,000 white labourers for the cotton fields during the present season. If so, we have a total effective force of 485,000 cotton raisers. The next question is, how much cotton can we reasonably expect to be raised per hand? Statistics show that in 1840, with a force of 600,000 labourers, our crop was 1,800,000 bales, or three bales per hand. When the labouring force doubled, between 1850 and 1860, the crop proved to be 4,500,000 bales, equal to three and three-quarter bales per hand. What then shall be our estimate for the present year? We must remember that there is a scarcity of stock and agricultural implements; that fences, gin-houses, and habitations need repair; that food must be provided; that much of the rich cotton lands along the Mississippi are not yet redeemed from overflow by the re-building of broken levees. Our dependence for a crop must rest chiefly upon the highland farms, which are far less productive than those of the lowlands. All things considered, we cannot expect more than three bales per hand, which would yield 1,440,000, or say a million and a half bales in all."

SUGAR IN FRANCE.—The quantity of beetroot sugar made in France to the end of March from the beginning of the season was 259,599 tons, against 144,788 tons in the season 1864–65 to the same time, or an increase of 114,810 tons over last year; as the French sugar consumption is only put down at 250,000 to 260,000 tons, France will this year produce on her own soil more than sufficient for her consumption.

COTTON GROWING IN BRAZIL.—From Para down to Rio Grande, the southernmost province of Brazil, all the provinces are stated to be capable of producing a supply of cotton, limited only by the amount of labour, and this in some localities is likely to be supplied by emigration enterprise, including many planters from the Southern States of the Union. The difficulty in extending cotton exports from Brazil has been hitherto ascribed to the great expense attending its transmission to the sea coast; but railways are removing this drawback, and will enable cotton growers to convey their cotton to market at a moderate cost. The northern provinces of Brazil, where cotton is at present chiefly produced, are in a flourishing condition, and Pernambuco alone is estimated to export this year a very considerable quantity, the effects of which are shown in the largely-increased imports of British manufactures, now almost equalling those of Rio de Janiero. Last December no less than 27,111 bales entered Pernambuco, and it is calculated that the crop of the present year for all Brazil will be about 550,000 bales. It is a curious result of the cessation of slave imports into Brazil, that in proportion as negroes have been sent from the northern provinces to the Rio de Janeiro, the latter have gone on increasing in prosperity, native labour gradually replacing that of the slave. There is a large indigenous race in the interior of the northern parts of Brazil, which has been gradually drawing towards the coast and uniting itself to the Brazilian population, besides a quiet and continuous flow of emigration from Portugal, Madeira, and other islands identified with Portugal, and who are capable of enduring the tropical climate of Brazil. In Brazil the cotton plant is a durable one, and not exposed to the contingencies of frost as in the Southern States of America. It attains its bearing growth in two or three years, and after that period becomes a permanent producing cotton tree, so that all labour of replanting is obviated, everything depending on the facility for picking, cleaning, and transit to the seaports.

BEETROOT SUGAR IN ENGLAND.—The *Journal des Fabricants de Sucre* says:—"The importance of beetroot sugar to the European trade cannot be too strongly insisted on, for it is no longer the crops of the East or West Indies which rule prices, but those of France and of Northern Europe, to which, perhaps, will also soon be added those of North America, into which continent the cultivation of beet is being largely introduced. It is not astonishing that so great a revolution and change in the centre of trade should attract attention in England, where it is asked why she also should not benefit by the new industry. It is well known that the rural economy of that country is based to a great extent on the cultivation of the turnip and mangel-wurzel, which last-named article is nothing else than the yellow root of Castel Naudary. These roots are eaten to a great extent in their natural state by cattle, and are thus the producing cause of a great quantity of meat and of manure. It is only a step to substitute the cultivation of the White Silesian Beet, which in its pulp gives almost as much food for animals, and furnishes, in addition, sugar, which by the other system is lost. There is only a step, we repeat, and this step England can take whenever she finds it advantageous; for nothing in her laws would form an obstacle to her doing so, notwithstanding the assertion recently made to the contrary in the Legislative Chamber by M. Pouyer-Quertier. We confine ourselves for the present to stating that the subject is being studied by our neighbours, and that the French and German refiners must look to their laurels. The introduction of beetroot sugar, that fruit of Napoleon the First's continental blockade, into England, would indeed be a sign of the times."

Colonies.

SHEEP DISEASE IN VICTORIA.—A number of sheep farmers having met in Melbourne to discuss the measures to be adopted for the eradication of the scab among the sheep in the colony, the following scheme was proposed:—A boundary line was to be established near the northern and eastern frontiers, across which no sheep were to be permitted to be conveyed, except from the protected district, to the Melbourne market. When this isolated piece of country was proclaimed clean, it was proposed to extend the line southwards, and so on by degrees until the whole colony was freed from the disease. By this plan no flock owner would be prevented from sending his sheep to the market, while the country above the boundary line would be protected from contagion. Of course, in the separated districts, the curative process must be vigorously carried on, and the attention to this duty must be enforced by the infliction of heavy penalties on those who neglect to take proper measures. There are provisions to be made for dividing the whole of the colony into clean, doubtful, and scabby districts; and the heavy penalty of ten shillings per head is to be enforced for every breach of the rules. Quarantine stations will be established in doubtful districts, and no sheep will be allowed to go from, enter, or pass over such runs until the whole of the sheep be cleaned, under a severe penalty. Stray sheep are recommended to be destroyed should the inspector fail to find an owner for them in a week, and Tasmanian sheep to be prohibited from entering Victoria.

THE NEW SOUTH WALES CUSTOMS REVENUE for the month of January last amounted to £68,140. For the corresponding month of the year 1865 the receipts were £51,292. The increase on the month is therefore £16,848, or nearly 33 per cent. This increase is owing to the large amount received for *ad valorem* duties, which alone have swelled the customs revenue by £15,000. Besides there are also the new duties on hops, rice, malt, and dried fruits, and the increased duties on rum, wine, and beer, so that without these additional taxes, the customs revenue would have shown a falling off.

THE ANNIVERSARY OF THE COLONY OF NEW SOUTH WALES was held on the 26th of January, being the seventy-eighth year of its existence. On that day, in 1788, Governor Philip pitched his tent in Sidney Cove, and hoisted the flag of England on the mound where Dawes' Battery now is, and the same flag has continued to wave ever since.

Publications Issued.

FIRES, FIRE ENGINES, AND FIRE BRIGADES. By Charles F. T. Young, C.E. (*Lockwood and Co.*)—This work is a history of manual and steam fire-engines, dealing with their construction, use, and management. To this are added remarks on fire-proof buildings, and the preservation of life from fire, and on the foreign fire systems; the work also gives hints for the formation of and rules for fire brigades, with an account of American steam fire-engines. For several years past the author has made the subject of steam fire-engines, their construction, and management, his special study. He has been in the habit of attending various trials of them, private as well as public, and of seeing them at work at fires, making his own notes and observations, taking measurements himself, or assisting others in so doing, and noting the particulars and results on the spot. The work is fully illustrated with explanatory wood-cuts and diagrams, showing the construction and working parts of engines, and appliances generally.

Notes.

NITRO-GLYCERINE.—The inventor of the practical adaptation of nitro-glycerine to blasting purposes, recently noticed in the *Journal*, Mr. Alfred B. Nobel, appeared as a witness in an action at New York against the shippers of the package which lately exploded at San Francisco. He testified that the preparation will not explode by setting fire to it, by friction, or by concussion, but that it requires 360 degrees of heat in a confined space to explode it. He has been engaged in the manufacture in Germany more than a year. Mr. Nobel accounts for the accident at San Francisco by presuming that the oil leaked into the sawdust packing, and was thus heated to the requisite degree. He refuses to believe that the catastrophe at Aspinwall was caused by nitro-glycerine, saying that had a single case of that substance exploded, the ship's bottom would have been blown out, and there would have been no second explosion. The inventor also stated that he was engaged in investigating the effect of the oil when mixed with sawdust, believing that thus a much more dangerous compound was obtained than nitro-glycerine itself.

INDUSTRIAL EXHIBITION AT STOCKHOLM.—The Lords of the Committee of Council on Education have received a communication from her Majesty's Secretary of State for Foreign Affairs, announcing the opening of an Industrial Exhibition at Stockholm, on the 15th of June next, showing the progress in art and industry in Sweden, Norway, Denmark, and Finland, and requesting that the proposed exhibition may be announced in England.

CHORAL PRIZES IN FRANCE.—In December last the Prefect of the Seine invited musicians to produce a number of choral compositions, without accompaniments, destined especially for the singing classes in the communal schools, including those for adults. The commission appointed to adjudge the awards was composed of MM. Ed. Rodrigues, General Mellinet, Ambroise Thomas, Ermel, Edouard Monnais, Vercollier, Kastner, Gounod, Pasdeloup, and Basin. There were 275 compositions sent in, and 23 were selected as deserving of prizes or commendations; five were rewarded with medals of the first class, or 300 francs; five received second class prizes, 200 francs; five medals of the third class, 100 francs; and the rest bronze medals, by way of honourable mention. Several of the successful candidates are well-known composers, and carried off more than one prize each. M. Jules Massenet, M. Leo Delibes, and M. Charlot obtained two each, and M. Th. Salomé five.

Correspondence.

SHOULD RAILWAYS BE THE PROPERTY OF THE PUBLIC?

SIR,—Your readers will remember that I took up this subject in a former communication, published in your *Journal* for March 2nd (p. 276); and in continuing it I feel how impossible it is to compress into the few lines of a letter, the "whole history" of a volume on railway management; and without "ample room and verge enough," it is impossible to say, what ought not to be left unsaid, to do the scantiest justice to the subject. I can therefore but touch and go; and I must pray your readers to understand that I pretend only to open the question, not to exhaust it.

If, by private enterprise, be meant management by public companies, I really know not from what source the idea was derived that it contrasts favourably with that of government. The business habits of the community as aggregates of proprietaries may be estimated by their investments in foreign loans and stocks—of which I do not think I speak with exaggeration when I aver that a half of the whole advances are irretrievably lost. That is a specimen of the judgment with which the public turn over their money when they are left to their own discretion. But to come nearer to the point at issue, let me ask Mr. Hawes to compute the proportion of the whole public companies in this empire that have so much as been enabled to keep in bare life. I am ready to examine the most successful. As a general rule, they have emerged from ruin after desperate struggles, only with the help of preferential shareholders, who threw good money after bad. Nearly two-thirds of our insurance companies, like Saint Patrick's frogs, have

"Committed suicide,
To save themselves from slaughter."

Banks innumerable have cut and run from bankruptcy only into amalgamation. It is not once a year, but almost once a week, that the most gigantic ruin overtakes financial leviathans; fraud upon fraud; knavery upon folly; losses counted by millions—not from unavoidable misfortune—scarcely from natural miscalculation, but from the sheerest imbecility—from the most reckless judicial blindness. Warnings have no effect; daily examples teach no lesson; the stupid, hand-over-head, Blunderbore reckless stolidity of shareholders and directors—their miserable asinine helplessness—their unprincipled cupidity—their shameless defiance of the rules of honest trading—rigging markets—manipulating shares—selling their name to vamp up rotten bubbles; can anybody say these are exceptional features of our companies? Our mining companies, what are they but lotteries? Our dock companies, what dividends do they pay? Of all the shipping companies that have been started, how few of them have avoided insolvency—how many have been scandalous jobs for selling mere old tubs at new prices, and rigging the market to produce a lying premium! I could put my finger now upon merchants of the highest class, eminently successful in their private concerns, who in their directorate of public companies have betrayed astounding incompetency, and involved themselves in disastrous loss by unaccountable carelessness and outrageous stupidity. Indeed, it is just when commercial adventures become public companies, with practically irresponsible directors, that their prosperity leaves them. A secretary of state has to account to ministers—is liable to daily question by the House of Commons. A director flourishes his proxies in your face, and defies you, until bankruptcy brings a too late disclosure. Most of the private concerns that have merged in boards of directors had all large profits to show, but a few months of board and shareholding management have, in many cases, been quite enough to sweep away all their goodwill and capital into the omnivorous *Gazette*. Nay, the *Times* has even

ventured to state that our largest banks, those in the best repute, and with the largest business, have been going on, no one can say how long, upon the supposition that there never could be a run upon them, and that they simply relied upon the aid to be obtained from the Bank (of England) if necessary, by a suspension of the Act. The Bank of England itself—could it have maintained its *own* position but for the periodical suspension of its own restrictions? Gas companies, canal companies, water companies, bridge companies, tunnel companies—how many of them have made any return whatever to their first shareholders? Of the history of railway companies how can we think or speak with patience? Of what one of them can we say that it has failed to go through every stage of fever and ague of pretence, misrepresentation, premium unwarranted, discount, insolvency averted only by desperate borrowing, and preferential stock out of all proportion to capital. Is there any conclusive proof even now of the perfect solvency of many which declare dividends? If they can pay their way, let them prove it by closing their capital accounts. While they continue to spend more money than they divide, I am perfectly entitled to deny that they have afforded evidence that they have earned actual profits. Not a year passes without some explosion, some alarming discovery of illegality, fraud, embezzlement, malversation. "Contractors' shares," what does that term mean? Simply that companies without actual adequate capital put themselves into the hands of usurers who sweat them out of exorbitant interest by taking payment for works at a much higher rate than the actual cost. In blessed unconsciousness of the inference to be drawn from it, Mr. Hill, at the meeting of the Society on the 7th February, complained that Mr. Chadwick had not made allowance for the difficulties through which companies had to struggle when they were driven to borrow at eight—he might have added nine and ten per cent. interest. That fact alone is conclusive proof of the recklessness and profligacy of a system which has to betake itself to expedients so utterly uncommercial, and to confess the scandalous miscalculation of its ways and means. Applied to an individual, it would be called placing a merchant in the hands of the Jews, or an heir granting *post-obits*. What one company has executed its works within its estimates? Which one of all of them has maintained its stock at par until it has descended far below it? Even the London and Brighton, the Great Eastern, the Great Western, nay, the Great Northern—through what stages have these lines passed—are even still passing? Mr. Roebuck, within the last month, had to complain of the corrupting influences of gas companies "beseeching and besieging" the members of the House of Commons; in what an aggravated form is that evil presented in the case of every railway contest.

What have been the results of this system of administration by directors? Simply the highest fares and the lowest dividends. While the value of money is ten per cent., the real average returns of all the lines do not exceed three, although those of the Continent of Europe under governmental control give eight, ten, fifteen per cent., charge not more than 60 per cent. of the English tariff, and are destined, at no distant interval, to become the absolute property of the nation. What is the reason? The average cost of construction of Belgian lines is £17,000, and of British £34,000. Is not that fact alone conclusive of the point of relative administrative competency? Not that such a circumstance is any plea for high fares. In England itself lines which cost the largest sum for construction carry at the lowest fares and yield the highest dividends. If there be anything in the natural circumstances of a country to enhance the cost of construction, that is invariably accompanied *ipso facto* by far out-balancing compensation. Density and wealth of population, which enhance the cost of construction, are just the very elements of crowded and profitable traffic.

But I maintain that railways ought to be more cheaply constructed and maintained in England than in any country in the world. In comparison to the work done, labour is cheaper here than anywhere else. Contractors execute foreign work with British workmen. Capital is normally cheaper here,—most foreign lines are constructed chiefly with British capital. Coal and iron—the raw material of what I may call the manufacture of transit, are indigenous products, which our foreign railway competitors have to buy from us. Our exports and imports, our internal trade, have doubled within twenty years—so has our income; our population increases at the rate of nearly one and a-half per cent. per annum; it forms the richest and most locomotive public in the world. Land is dearer in Belgium, in Holland, in many parts of France, in some parts of Italy, than in England. The difference in cost proceeds from nothing but extravagance and hand-over-head mismanagement, arising entirely from the execrable character of our administration, which is wholly without system. No traffic could sustain the magnificent wastefulness of the Great Western Company. Just think of the inconceivable absurdity of constructing the roads of a kingdom, the very object of which is intercommunication, in such a way that the vehicle used on one road cannot run on another! Broad gauge, narrow gauge, mixed gauge, have led up, by the conceit of engineers, and the freaks of directors, to the result of offering the most perverse obstruction to intercourse and transit, where the sole object of all the operations is to promote both. The whole concern is a huge national blunder.

Had government—the State—undertaken the construction of the roads of the country, to the public, to trade, to the poor would have been saved—

1st. The whole cost of parliamentary contests.

2nd. The extortionate parochial taxation imposed on railways.

3rd. The passenger duty.

4th. All claims for compensation, for injury, loss, or damage. The Post-office servants themselves are constantly detected purloining the property of correspondents. The authorities refuse to recognise any claim on that account. The business of the State is to produce a good system; the public must take it as they find it, and each subject must take his own risk. The case here is very strong, because by law the lieges are inhibited from sending their letters by any other channel, while the State refuses to guarantee safe delivery. The fraud and extortion practised by travellers in claims for compensation for personal injury or loss of goods, have risen to the science of a system. Persons have been paid large sums for being maimed who had never travelled at all, and for loss of goods which they never had. All this ultimately comes out of the pocket of the public.

5th. The scandalous extortion of owners and occupiers of land and houses, who claim compensation for the infinite improvement in the value of their property caused by the very line they affect to oppose. The state would have laid down rules for claiming and ascertaining actual—not hypothetical or fanciful loss—that would have saved at least one-half of the exorbitant sums, which have been paid simply to save a larger contingent expense; and at the same time have rendered perfect justice to every claimant. The plain fact is, the public mind of this country is debauched and sordid—corrupted by the jobbing rule of higgling railway solicitors, and surveyors who haggle with claimants. Unlike the citizens of Greece and Rome, ours have no idea of any sacrifice for the good of the community. The first thought of every claimant is not honest compensation, but how to make an extortionate profit out of the country. An owner or lessee thinks his fortune is made when he receives notice of a line coming through his property. All these delusions would have been dispelled had claimants had ministers to deal with whom they could not threaten with Parliamentary opposition or heavy cost before a jury, but who would have laid down a specific

could rise to the height of this great argument it would do

"Things unattempted yet in prose or rhyme."

The wisest of nations has made roads the foundation of all civilisation. Rome has left her mark in highways and bridges all over Europe. In England, while famine raged in one county from murrain and blight, the crops were rotting in the fields of another for sheer want of consumption, at the time when bridle paths were the only thoroughfares, and woolsacks were conveyed over the country on horses' backs. In my boyhood the price of large haddocks, in Edinburgh market, was a penny each; well-grown cod were 5d.; crabs, 1d. or 2d.; oysters, from 8d. to 1s. per long hundred of 120. Glasgow, forty miles off, could scarcely get fish at all. Now, railroads have made fish nearly as cheap in Manchester and London as in Edinburgh; while Scotch game and salmon, which we learn from a recent book on Scottish manners, the poor people of Inverness-shire refused to eat, form the luxuries of the metropolis. To my surprise, the Newhaven and Musselburgh fish-women, who never travelled further than to Edinburgh with their "creels," I found at Stirling, and far up the Tweed, borne inland by railway many miles to new retail customers, and earning large profits by the accommodation. Transit and intercourse determine the whole trade of every country. Cutlery has moved from Salisbury to Sheffield; serge, flannels, from Devonshire to Yorkshire; calico-printing, silk-weaving, broadcloth manufacturing, have all gradually moved from Wiltshire and Middlesex to Lancashire and Lanarkshire, because coal and iron were on the spot, and shipping was near. I was credibly informed that on the Mississippi, until railroads developed transit, the captains of river steamers have been seen throwing hams into the furnaces on the occasion of a race with a rival boat. Mr. Duncan Stewart, of Detroit, states, "The farmer of Illinois, who could only get eight cents. per bushel for his (Indian) corn, had to give the carrier the price of five and-a-half bushels to carry one bushel from Chicago to New York. If the St. Lawrence canals had been navigable, 25 cents. per bushel would have warehoused the same corn in Liverpool." Mr. Brackstone Baker, Secretary of the Great Western Railway of Canada, observes, "In Wisconsin and Iowa, corn is actually burned for fuel, being cheaper than cordwood at 1½ dols. per cord; and in Illinois it costs the farmer three bushels to get the fourth to market in New York. Indeed, it has been shown by actual experience of shipment of corn from Chicago to Liverpool, that seven-eighths of the value of a bushel, when delivered at the latter port, are freight charges. At the Commercial Convention, the Aspinwall President of the Board of Trade declared that the North-West States of America were capable of producing bread-stuffs for 100,000,000 of people, and there is still a greater corn production growing up daily to the west of Chicago." I have known waggon-loads of cauliflowers, and many tons of green-stuffs, thrown on to the dung-hill, or given to the cows at Covent-garden market. Men of enterprise—daring the venture—have driven off their loads to King's-cross and Euston-square, sent them to Manchester and Leeds, and, after paying heavy freight, have realized large profits. Could that be ventured upon always at the lowest paying freight, the gain to the horticultural industry of the metropolitan counties would be inestimable. At the pit-mouth coals are sold at 4s. 9d. per ton, which, when they reach London, cost the consumer 25s. It is seen above that the labourer has to work out the value of eight bushels of corn to be in a condition to give one bushel to his family. Mr. Gooch, manager of the Great Eastern Railway, reports that the cost of carrying 190 tons of coals, including every charge of service, locomotive power, guards, oil, permanent way, management, &c., &c., is just 1s. 1⅛d. per mile. The company charges 8s. 7d. for that service. Space does not permit me to illustrate this subject by even the barest facts. It must suffice me to say that as a general rule the costs of transit are nearly as heavy as the price of the article carried—and that therefore the power that commands the means of carriage of the trade of a country in fact controls its entire commerce. The infinitely expansive power of trade and consumption, as the result of cheapening cost, is such that in a country like ours it is practially without limit. Correspondence, by a reduction of 500 per cent. in the charge, has increased 1,500 per cent., with a net increase of profit to the carrier already of 16 per cent. Gas, by a reduction of 400 per cent., yields a large profit—tea, coffee, sugar, the raw materials of manufacture, corn and provisions, by a reduction of taxation, have enlarged in consumption to an extent that proves demand only to be limited by price, and to expand in quadruple the ratio of cheapness. A ton of cutlery takes up no more room, and is no heavier than a ton of pig-iron. Why is it to be charged ten times the freight? A bale of silk or broad cloth occupies no greater space than, and is not half the weight of, a sack of corn. On what principle is the manufacturer taxed 500 per cent. more than the farmer? How absurd are our delusions. A tax paid to a railway company operates to the discouragement of trade as effectually as a government duty on corn, wool, cotton, butter or beef,—yet the nation formed an Anti-Corn Law League, and brought the country almost to the verge of revolution to relieve itself of protective duties, while it supinely permitted the carriers of the country really to re-impose them in another shape for their own profit. To what end are reciprocity treaties? Simply to enable us to get foreign goods at a low rate, and to sell our own at a higher profit. But if railway companies keep on the tax, and add to the price the amount of the repealed export and import duties, what was the use of Mr. Cobden, for what have we a Chancellor of the Exchequer? The railway revenue is already nearly one-fourth more than the interest on the National Debt. I do not hesitate to say that if the nation taxed itself £5,000,000 a year, it would be a vast gainer by making passage and carriage free. Every farthing the railway company takes is a tax; whatever was taken off would be practically added to the revenue of the country. This is distinctly proved by the fact that what was taken from the protected interests was immediately felt in an increased exchequer. In increased and redundant cost of management alone, the staff of four hundred railway companies tax the public at least a million a year. Under one uniform system much of this would be saved. Captain Laws estimates that a reduction of 25 per cent. on the fares, equal to a saving to the public of £7,500,000 a year, might be effected by reducing the entire railway economy to the uniformity of the Post Office system. Even under our existing dispensation, sagacious merchants assure us that trade is but in its infancy. Take warning. By our absurd Bank Act system, every state, almost every public company in Europe, America, India, Africa, comes to our market, and bears off our gold. Our own money is employed to raise up rival commerce and manufactures. Our own colonies take engines from Germany and Switzerland in place of England. If foreign commerce gets the start of ours by cheaper transit and carriage, we may never recover the loss. While money costs 10 per cent. in London its price is 4 in France. That is practically a profit of 6 per cent. in favour of French trade. Think for a moment of this. If by being taxed £20,000,000 a year more than we are, being 20s. per head, you and I could get our domestic coals at a saving of 10s. per ton, and every article of luxury and consumption could be as cheap to us as at the place of production; if, for example, I could get fish in London at the Orkney price, beef and mutton as low in Cheapside as in Skye or Ross-shire; if coal, and iron, and wool, cotton and silk, could be carried to our rural districts, and there delivered at the Lancashire and Lanarkshire price, so that manufactures and trade would become equally diffused even in the south and west, and spinners and weavers alter-

nated with the peasantry, in place of being congested in the north, is it really possible to estimate the prodigious gain to the country?

The acreage of Scotland is exactly that of Ireland. Six hundred thousand of the Scotch are employed on 20,000,000 of acres, and nearly six millions of Irish are without any other dependence than agriculture. Practically, there are no minerals in Ireland, while Scotland is rich in coal and iron. There are no manufactures in Ireland, except in that part of Ulster nearest the British coal and iron fields. Deliver the raw materials of manufactures and commerce as cheaply to Connaught, Munster, and Leinster as they are to Glasgow and Manchester, and it is not too much to say that Ireland would become as prosperous as Great Britain, and pay back in increased revenue double the whole cost of transit and carriage.

I plead the case high indeed, because I have faith in the principle. Let our policy be tentative and experimental. Let Government take the same risk of loss of revenue by assuming the management of some lines, to begin with, as it did in reference to postage. Nothing is really more plain than that if, as is the fact, the yearly tax of my transit to London is £20, and that on my family is as much more, I should be a clear gainer of £20 by an addition of £20 to my income tax, if travelling were gratuitous. On an average the carriages are not more than one-third filled. Two gratuitous passengers to every one that pays might be added with little increase of cost. A saving of 5s. carriage per ton on 26 tons of coal yearly consumed will afford £3 5s. to the Exchequer, and leave the like amount in my pocket. The working man's family, kept in healthy villages, in place of seething towns, while he is carried to and from his work, and enabled to go at once to the best labour market; how much could he not afford to pay to the Exchequer for that?

But this theme runs away with me. Mr. Galt may be regarded as a visionary; so was Adam Smith; so were Watt and Brindley; so was Rowland Hill; so was Richard Cobden. What is Mr. Galt's vision but a new edition of the realised apocalypse of these great thinkers? Peel did not think it a dream; Gladstone does not. A commission is even now sitting, to consider whether it be not a reality. It is the prerogative of England to "teach the nations how to live;" here is her most instructive lesson.—I am, &c., SIDNEY SMITH.

The Manor, Feltham.

JEWELLERY IN THE PARIS EXHIBITION OF 1867.—SIR,—In reply to your communication of the 7th April, we beg to say that the reason why the important department of English manfacture to which we belong will be comparatively shut out from the Paris Exhibition is that the French laws refuse that freedom in the sale of goods by English exhibitors which was enjoyed by the French and all other nations in the London Exhibitions of 1851 and 1862. In England only a few articles in jewellery are by law required to bear the English assay mark, the great bulk of the trade being open and without restriction to the whole world. But in France no gold jewellery whatever can be sold without it has first been assayed, found of a precise standard, and stamped with a government stamp in Paris.* When we received an invitation to become exhibitors in 1867, we wrote to the English Commissioners to know whether English jewellers would be equally free to sell their productions in Paris as the French jewellers were in London. We were politely referred to the printed "articles," or instructions issued by the Imperial Commissioners. On replying that we had already searched and found nothing satisfactory therein, we were informed that a special application would be made on the subject to the authorities in Paris. After some two months, we received an official reply that no jewellery would be permitted to be sold in Paris excepting subject to the French laws of assay and marking. Now, as it is not to be expected that English manufacturers will risk considerable capital and incur immense trouble in producing and exhibiting a number of their best specimens without a possibility of remuneration by sales, and as the conditions of sale are so hampered by this sending to Paris for marking, thereby opening to the French trade the very designs you would wish to appear as novelties, and thus showing your best cards to the opponent in the game, it is not very likely that any but a special class of English jewellery exhibitors will appear on their catalogue. This class will exhibit from interests so widely different from those that would affect the general manufacturer, and the goods they will show will also be so unlike those required by the general English public—even of the better classes—that we may safely say the English productions in this trade will be almost unrepresented. The great and growing importance of this branch of industrial art in Birmingham induces us to offer these remarks, which we feel sure will apply with equal truth to the manufacturers (not being shopkeepers) of London; and which will explain the absence of those names which, from their reputation and importance as *bonâ fide* manufacturers, might be expected to appear in the catalogue of jewellery exhibitors in the Paris Exhibition for 1867.—We are, Sir, yours, &c., T. and J. BRAGG.

18, Vittoria-street, Birmingham.

* Possibly also in other French cities, but certainly not in London or Birmingham.

MEETINGS FOR THE ENSUING WEEK.

MON......British Architects, 8.
R. United Service Inst., 8½. Capt. H. Shaw, R.E., "The Present State of the Question of Fortification."

TUES. ...Medical and Chirurgical, 8½.
Civil Engineers. No meeting, being Whit-Tuesday.
Zoological, 8½.
Ethnological, 4. Annual Meeting.
Royal Inst., 3. Prof. Ansted, "On the Application of Physical Geography and Geology to the Fine Arts."

WED. ...Society of Arts, 8. Mr. G. W. Muir, "On Granite Working."
Geological, 8. 1. Rev. F. W. Holland, "Notes on the Geology of Sinai." Communicated by Sir R. I. Murchison, Bart. 2. Mr. H. Woodward, "On a new Phyllopodous Crustacean from the Moffat Shales, Dumfries-shire." 3. Mr. H. Woodward, "On a new Brachyurous Crustacean from the Forest Marble, Wiltshire." 4. Mr. H. Woodward, "On the genus *Eryon* of the Lias and Oolites." 5. Mr. J. Plant, "On Primordial Fossils in the Lingula-flags of Tyddyngwladis."
Archæological Assoc., 8½.

THUR. ...Linnæan, 3. Annual Meeting.
Royal Inst., 3. Prof. Huxley, "On Ethnology."

FRI ......Royal Inst., 8. Mr. Alexander Herschel, "On the Shooting Stars of the Years 1865-6."
R. United Service Inst., 3. Mr. F. A. Abel, "Gun Cotton and other Explosive Agents."

SAT ......R. Botanic, 3¾.
Royal Inst., 3. Prof. Huxley, "On Ethnology."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 3rd May, 1866.

104. Bills—Public Libraries Act Amendment (amended) (corrected copy).
114. ,, Naval Savings Banks.
122. ,, Execution of Deeds.
127. ,, Lunacy Acts (Scotland) Amendment (amended).
128. ,, Hop Trade (amended).
129. ,, Dean Forest (Walmore and the Bearce) Commons.
193. Sugar, &c.—Tabular Return.

Delivered on 4th May, 1866.

93. Bills—Fishery Piers and Harbours (Ireland).
118. ,, Landed Property Improvement (Ireland).
124. ,, National Gallery Enlargement.
132. ,, Burial in Burghs (Scotland).
174. London (City) Traffic Regulation Bill—Special Report, Evidence, &c.

196. *The Eagle Speed*—Report.
224. Epsom Common Inclosure—Report.
Public General Acts—Caps. 16 to 20.

Delivered on 5th May, 1866.

130. Bills—Tenure and Improvement of Land (Ireland).
136. „ Curragh of Kildare.
111. Chain Cables and Anchors—Correspondence.
190. National Debt—Returns.
202. Record Publications—Treasury Minute.

Delivered on 7th May, 1866.

201. Maidstone Election—Minutes of Evidence.
210. Lancaster Borough Election—Minutes of Evidence.
232. Public Income and Expenditure—Account.
239. Sugar—Return.
Electoral Returns (Scotland)—Returns.
Live Stock in the United Kingdom—Returns.

Delivered on 8th May, 1866.

69. Bills—Real Estate Intestacy.
135. „ Rateable Property (Ireland).
118. Deviation of Compasses—Correspondence.
217. Poor's Houses (Scotland)—Returns.
219. Whipping Juvenile Offenders—Letter.
221. Juries—Return.
242. Redistribution of Seats—Return.

Delivered on 9th May, 1866.

131. Bills—Mines Assessment.
138. „ Redistribution of Seats.
140. „ Representation of the People (Scotland).
143. „ Compulsory Church Rate Abolition.
15. (345) Railway and Canal, &c., Bills—Board of Trade Report.
211. Rye Election—Minutes of Evidence.
220. Rifled Guns—Return.
242. Redistribution of Seats—Return (corrected copy).

Delivered on 10th May, 1866.

94. Bills—Labouring Classes Dwellings (Ireland).
103. „ Railways Clauses (amended).
133. „ Admiralty Court (Ireland).
144. „ Terminable Annuities.
145. „ Customs and Inland Revenue.
203. Bantry Pier—Correspondence.
213. Shannon River—Report, Evidence, &c.
228. Kitchen and Refreshment Rooms (House of Commons)—First Report.
241. Malt and Barley—Returns.

Delivered on 11th May, 1866.

134. Bills—Church Temporalities Acts (Ireland).
141. „ Life Insurances (Ireland).
143. „ Compulsory Church Rate Abolition (corrected copy).
212. Savings Banks—Accounts.
212. (I.) Savings Banks—Return.
227. Royal Academy—Correspondence.
230. Lord Lyon King at Arms—Returns.
231. Spirits—Returns.
234. Fife Mails—Report.
246. Ramsgate Harbour—Statement.

Delivered on 12th May, 1866.

139. Bills—Companies Act (1862) Amendment.
142. „ Representation of the People (Ireland).
148. „ Pier and Harbour Orders Confirmation.
152. „ Solicitor to the Treasury.
154. „ Poor Persons Burial (Ireland) (Lords Amendments).
143. Superannuations (Public Offices)—Account.
207. East India (Irrigation Works)—Despatch.
218. Smoke—Letter.
245. Merchant Seamen's Fund—Account.
260. Redistribution of Seats (Ireland)—Return.
Army (Armstrong and Whitworth Committee)—Report of the Special Committee, Vol. I.
Colonial Statistics, Part X. (1863)—Statistical Tables.

Patents.

From Commissioners of Patents' Journal, May 11th.

GRANTS OF PROVISIONAL PROTECTION.

Animals' skins, shaving—979—W. Ingham.
Bands, fastenings for metallic, used in baling—1097—J. Holmes and J. C. H. Slack.
Bar iron and steel—1104—A. V. Newton.
Beetling engines, beetling beams for—1124—C. Mather.
Blue colouring matters—1107—E. C. Nicholson.
Boots and shoes—1117—E. T. Hughes.
Bottle stoppers—1110—D. L. Nicolas-Daubisgnye and R. D. Clegg.
Carbonates and bicarbonates of soda and potash—1108—G. Lunge.
Cigar-holder, &c.—1166—H. C. Butcher.
Doors, &c., fastenings for—1118—J. Allen.
Dress fastenings and ornaments—1131—J. G. Taylor.
Eye glasses—1105—C. Dales.
Fibre, washing—1138—G. E. Donisthorpe.
Fibrous materials, combing—1052—J., C., L., and M. Jefferson, and J. Greenway.
Fibrous substances, combing—1071—E. Ash and T. Whitley.
Fire-arms, breech-loading—1101—E. Wilson.
Fire-places—1111—T. Prideaux.
Flax and hemp, breaking and scutching—1149—C. D. Abel.
Fluids, valves for—1113—C. J. Waddell and H. C. B. Muir.
Furnaces—1167—A. Borgnet.
Furnaces and fire-places, grates for—1129—A. V. Newton.
Furnaces, utilizing the fumes of—1098—W. Oldham, H. Pean, and C. Eades.
Gas burners—706—S. S. Brown.
Glass, oven for cooling—1159—D. Bievéz.
Grinding, mills for—1048—W. Clark.
Harmoniums—1144—H. T. Wedlake.
Hot-blast stoves—1137—J. Player.
Iron or steel, articles made of—1106—D. Evans.
Kilns, fire-places of—1147—R. W. Abbotts.
Loom-sewed fabrics, producing—1030—W. Wishart and P. Cameron.
Metals, incurvating—1140—M. Spiquel and E. H. Florange.
Metals, stamping—1139—M. Spiquel and E. H. Florange.
Minerals, getting—1136—G. E. Donisthorpe.
Mortise locks, attaching knobs to the spindles of—1100—G. Beales.
Motive power, obtaining—267—M. A. F. Mennons.
Nautical instruments—838—M. Henry.
Ordnance—1109—W. Webb.
Pianofortes—1154—S. Thompson.
Pipes, joints or connections for—1157—C. D. Abel.
Portable irrigators—1145—J. Pumphrey.
Portable sun dial—1127—J. Jewsbury.
Pulpy substances, expressing liquids from—1130—W. E. Newton.
Railway carriages, &c., couplings of—971—R. D. Morgan.
Receptacles, coverings for—1115—J. H. Johnson.
Rivers, clearing, &c.—1018—T. P. Tregaskis.
Rotary pumps—982—W. H. Phillips.
Sea water on board ships, distilling—1134—J. H. Wilson.
Sewage, deodorizing—1163—G. E. Noone.
Ships—560—M. Samuelson.
Ships' bottoms, coating—1102—R. Hamilton.
Spinning and doubling—1112—C. Hastings, J. Briggs, J. Law and E. Mitchell.
Spinning machines, spindles for—1151—J. M. Hyo-Catteau.
Spring bed or mattress—1165—W. E. Gedge.
Steam engines—1161—J. S. Crosland.
Steam gauges—1006—R. W. Thomson.
Tanning—1046—J. M. Macrum.
Thermo-electric batteries—1135—J. Baker.
Thread, finishing—888—S. Barbour.
Tobacco plant, applying a vegetable plant for the—1132—F. C. B[illegible]
Veneering—1152—R. Thompson.
Vessels, ejecting water from the holds of—1142—H. A. Hunt.
Vessels, propelling and steering—354—D. Spink.
Waterclosets, screw valves for—1062—G. T. Blundell.
Water-wheels—1099—E. Tuttle.
Weaving, preparing warps for—1103—A. Turner.
Woven fabrics, drying, &c.—1146—J. O. Ramsbottom.
Yarns, bleaching, &c.—468—J. Barlow.

PATENTS SEALED.

2927. J. Williamson, J. Lindley, and J. Coleman.
2928. J. A. Loubat.
2929. J. Dixon.
2932. T. Dobie.
2937. W. Bunger.
2939. G. Chambers & G. Gregory.
2944. J. Goodier & J. F. Kilshaw.
2946. W. Easton.
2965. J. Harbert.
2969. L. E. Laurency.
2982. J. Weems.
2984. W. J. Burgess.
3012. W. R. Mulley.
3076. J., E. R., and T. Hol[illegible]
3107. L. J. Bouchart.
3117. P. A. Muntz.
3127. G. E. Donisthorpe.
3355. E. V. Gardner and L. A. [illegible] and H. A. Israel, jun.
234. D. Lord, T. Lancaster, [illegible] R. Bennett.

From Commissioners of Patents' Journal, May 15th.

PATENTS SEALED.

2952. R. Jones.
2953. S. H. Huntly.
2956. W. H. Cope.
2961. A. S. Brooman.
2968. W. Payton.
2971. S. H. Huntly.
2972. F. Wilkins.
2973. J. C. Walker.
2974. H. Clifton.
2981. C. Witney.
2985. G. Smith and C. Ritchie.
2990. S. Bennett.
2993. A. C. St. P. de Sincay.
2994. G., G., jun., & C. W. Smith.
3004. S. Hunter.
3011. J. Ellis, jun.
3019. G. Moreton.
3021. R. Mallet.
3026. J. Draper and W. Leach.
3055. J. Thompson.
3114. W. E. Newton.
3198. E. L. Walker.
3214. A. V. Newton.
3215. A. V. Newton.
3248. T. Parker.
3284. W. Clark.
3292. W. Clark.
3298. H. E. Newton.
3308. W. Clark.
3325. W. E. Newton.
3361. W. E. Newton.
114. W. R. Lake.
761. J. W. Yates.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1153. C. L. Braithwaite & J. Hirst.
1161. J. Stickland.
1195. R. A. Brooman.
1194. H. L. Emery.
1212. A. Pilbeam.
1234. J. T. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1173. G. Bell.
1250. J. P. Budd.

Journal of the Society of Arts.

FRIDAY, MAY 25, 1866.

Announcements by the Council.

ORDINARY MEETING.

Wednesday Evening, at Eight o'Clock:—

MAY 30.—"On Popular Errors concerning Australia." By the Hon. CHARLES GAVAN DUFFY.

CONVERSAZIONE.

The Council have arranged for a Conversazione on Wednesday evening, the 13th June, at the South Kensington Museum, cards for which will shortly be issued.

FIFTEENTH ANNUAL CONFERENCE.

The Fifteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards will be held on Wednesday, the 13th June, at Twelve o'clock, noon. WILLIAM HAWES, Esq., Chairman of the Council, will preside.

Secretaries of Institutions and Local Boards are requested to send, as soon as possible, the names of the Representatives appointed to attend the Conference, and a copy of the last Report of each Institution should be forwarded, by book post, without delay.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the Results of the Examinations, as well as the Programme of Examinations for 1867.

The following suggestions of Subjects for Discussion have been received from various quarters, it being understood that in putting them forward the Council express no opinion whatever upon them:—

1. The scheme of Elementary Examinations:—Whether the Society of Arts should continue to furnish Elementary papers to Unions and Local Boards, or whether it would be better for the Society to confine its attention exclusively to the Final Examinations?

2. Presuming the outline of the present scheme to be retained, whether any modifications in the details should be made, such, for instance, as

(*a*.) To substitute the terms First and Second Divisions for "Higher and Lower Grades," and to award first, second and third class Certificates to successful Candidates.

(*b*.) So to arrange the time-table that the Examinations shall not clash with those of the Science and Art Department.

(*c*.) That English Grammar be added to the list of optional subjects.

3. What means can be adopted to secure a greater number of Female Candidates at the Elementary Examinations?

4. Whether the great City Companies and other analogous bodies might not be invited to co-operate with the Society in promoting the Education of Adults by special prizes for competition in subjects with which such companies are officially concerned, or among Candidates connected therewith?

5. Whether the co-operation which already exists between this Society and the Royal Horticultural Society for the promotion of Education among Gardeners, might not be extended to other societies, with a view to the better promotion of Education among other classes of working men?

6. Whether cheaper Text books could not be in some cases recommended to Candidates at the Final Examinations, or whether any means could be adopted for enabling them to have ready access to the more expensive ones?

7. Whether it would be desirable for the Council to endeavour to interest the clergy, gentry, and others in country districts, in the Society's scheme of Examinations, by issuing an explanatory address, and directing attention to the existence of Local Educational Boards?

8. How far employers in London and other large towns can be induced to aid the Educational scheme, by giving to young men in their employ special encouragement to join the Institution Classes?

9. How can Institutions promote competition for the Prizes offered by the Society of Arts in Art-Workmanship?

10. The possibility of establishing Museums of a simple character, to circulate throughout the country, in connection with Institutions and Evening Schools, on the plan adopted by the Science and Art Department for Schools of Art.

11. By what means can the Society of Arts promote the erection of suitable buildings for the use of Literary and Mechanics' Institutes?

12. In what way can the Society of Arts aid Institutions in securing the services of gentlemen qualified to give popular Lectures on Scientific Subjects?

13. Can a Literary Institute be so conducted as to provide rational amusement and the means of mental improvement for the *various* classes of society? And, if so, what appliances are necessary for the successful working of such an Institute?

14. The promotion of athletic exercises, especially in the metropolis and other large towns, by establishing Gymnasia or otherwise.

Notice of any other subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference should be sent to the Secretary of the Society of Arts.

Representatives of Institutions and Local Boards attending the Conference are invited to the Society's Conversazione, at the South Kensington Museum, on the evening of the same day (13th June), and will receive cards on application at the Society's House, on the day of the Conference.

CENTRAL HALL OF ARTS AND SCIENCES.

The arrangements for erecting a Great Central Hall of Arts and Sciences at Kensington, on the ground purchased out of the profits of the Exhibition of 1851, having een carried so far as to secure the erectior of that building, it has been thought desirable that members of the Society of Arts should be put in possession of full information on the subject, in case they should desire to invest in the property, before

strange and anomalous a relation to each other at the present moment as the Australian continent and the British islands. The conditions which ought to ensure mutual goodwill are unusually abundant. The population of that continent is not only from the same stock as your own, but consists in a large degree of men and women who within a few years were your fellow-citizens and neighbours. Its institutions are not only of the same general family, but are strictly identical with yours, wherever identity was not impossible. Its social customs and its intellectual enjoyments are the fondly-cherished habits of "home." Its material interests are so closely intermingled with yours that many kingdoms of Europe where ambassadors are maintained and special correspondents despatched to foster friendly relations, add less than it does to the annual accumulation of wealth and expansion of commerce in England. Within a dozen years more than four hundred thousand persons have left these islands to establish themselves there; and no four hundred thousand, taken at random from those who remained, have been so profitable customers to the merchants, manufacturers, and artisans of the common home, or have contributed so much to its prosperity. Moreover, it would be a great mistake to suppose that these emigrants consisted merely of the rank and file of an "army of industry." It is a rare thing now to meet with a single family of the middle classes which has not sent at least one recruit to Australia. When the lands were thrown open to pastoral occupation, and again at the period of the gold discovery, a multitude of younger sons of the gentry and professional classes flocked to it, as their ancestors had followed Raleigh to the then newest world. And many of the names which have been dearest to these islands in our own day are borne in Australia by descendants, or close collateral relatives of the men who made them famous. To take a few notable instances, there have been within the last ten years, and in most of the cases there are still among the Australian population, members of the families of Wordsworth, Coleridge, Arnold (of Rugby), Brougham, O'Connell, Jenner, Faraday, Babbage, Whewell, Stephen; or to come still closer to present tastes and sympathies, Dickens, Gladstone, Kingsley, William Carleton, Macready, Helps; or to take the immense community which is sometimes called the religious world—sons of Edward Irving and Baptist Noel, and a brother of Frederick Lucas hold public appointments in Melbourne; and every city on the continent could produce a list of the same character. Yet with all these common sympathies and interests there are few countries in the world of which the people of England have received impressions so erroneous and untrustworthy as the Australian colonies. The colonists recount with bitter pleasantry stories of grotesque mistakes, not merely in Australian politics, but in the cardinal facts of Australian geography, made from time to time by conspicuous writers and speakers in England. But they make cheerful allowance for imperfect information upon facts lying so far from the business of daily life, where the ignorance is not associated with arrogance or malice.

They are persuaded, however, and upon no light grounds I think, that the rivals and enemies of England are treated with less harshness of judgment than is habitually exhibited towards the colonists by many public writers in this country. Whatever is good is ignored or grudgingly admitted; whatever is not good is distorted and exaggerated out of all resemblance to the truth. Instead of regarding this great social expedition of our people to new regions with some of the interest and sympathy never denied to military expeditions—instead of recognising in their remarkable labours, in the cities which they have founded, the wealth which they have added to the storehouse of human comfort and prosperity, and the states which they have created and governed, conquests to be proud of, they are habitually represented as little better than the semi-barbarous and chaotic republics of South America. When one comes to inquire what is the root of this prejudice, it will be found, I think, generally to spring from a belief that the Australians, having a great trust committed to them in the complete power of self-government, have abused it, and run riot in licentious excesses. It is amazing how wide-spread and deep-rooted this belief has become, considering the slender foundation upon which it rests. In what respect has government failed in Australia? Those who have had the duty of governing these communities for the last ten years consider that they were engaged in a deeply interesting and pregnant experiment, which has been conducted on the whole in a manner to deserve the applause —and not the censure—of thoughtful men. A community composed of the middle and lower classes attempted, practically, for the first time, to work the complicated machinery of the British Constitution, not only without the counterpoise supplied at home by the personal influence of the sovereign and of hereditary rank and wealth, but in connection with a franchise which, from the circumstances of the country, was necessarily nearly as wide as the adult male population; and yet to preserve completely intact the principles and the machinery of responsible government—the most marvellous system for accomplishing peaceably the wishes of a free people that mankind has framed.

Under these conditions colonial statesmen have undeniably preserved public order, maintained public credit, and fostered national prosperity. They have so well preserved it that a man's life, liberty and property are as effectually under the protection of law in the city of Melbourne as in the city of London; and marvellous as the prosperity of England has been in the last ten years, it is less prosperous than Australia. In what respect, then, has Government failed? Public men have committed mistakes, of course, for mistakes are committed in all experiments; but these are the results which have been attained.

Whenever I have pressed any person prejudiced against Australia with this question, I have invariably found that political instability was what alarmed him; that he considered a ministerial crisis was the normal condition of Australia, and that we set up governments like nine-pins only for the pleasure of knocking them down again. I recently heard a man of distinguished ability, in one of the most memorable speeches delivered in the present House of Commons, declare that in Australia the stability of society, industry, property, and the well-being of the community, were endangered by constant changes of ministry, and that it would be necessary for their own safety to deprive the colonists of responsible government, and create a stable executive instead. I am well aware that party politics are forbidden here, and I have not the slightest disposition to obtrude them; but the government of colonies is a question of political science, and the primary condition of governing any community is to understand its actual condition. I would invite you, therefore, to look at Australia historically, putting the distance of place in lieu of distance of time, and to test by one or two instances how far this sort of popular belief is well founded. Is it true, in point of fact, that the Australian colonies have been signalized by constant, or even by unusually frequent, changes of government? I know the belief is all but universal in England; but I doubt if many of those who accept it have taken the trouble to inquire whether it is perfectly well founded. I copied recently, from a number of the late *National Review*, a statement of this character even stronger than Mr. Lowe's, and, as it was apparently made without a political object, I prefer to select it for analysis. In an article upon the American War (in the 26th number of the *Review*), the writer incidentally describes the experiment of establishing parliamentary government in Australia, and without taking any trouble to argue the question, delivers judgment as upon a point where the public mind was already made up:—

"It is, however (he says), only fair to observe that

the American Constitution has one great excellence at this moment, not indeed as compared with the English Constitution, but as compared with that degraded imitation of it which exists, for example, in our Australian colonies. In those governments the parliament is wholly unfit to choose an executive; *it has not patriotism enough to give a decent stability to the government; there are 'ministerial crises' once a week, and actual changes of administration once a month.* The suffrage has been lowered to such a point among the refuse population of the gold colonies, that representative government is there a very dubious blessing, if not a certain and absolute curse."

Here are not only general and sweeping imputations, but, fortunately, exact and specific statements. If an Australian, familiar with the facts, were to reply that the governments so savagely disparaged had work to do in founding and organising new states as serious as fell to the lot of any administration in Europe during the same period, and did that work in general effectually, to the satisfaction of the people who confided power to them; and further, that to mistake for confusion and chaos the vigorous action of new communities which appeared regular and well ordered to eyes familiar with the forces at work, was like the dogmatism of the deaf spectator of a waltz, who insisted that the performers were lunatics because he could not hear the music which gave meaning and harmony to their movements; moreover that this sort of thing and worse than this had been written in England of the first memorable Congress of the United Colonies of North America, with no benefit to any one concerned, but much evil; if, I say, an Australian made this sort of defence, though strictly true, it would, perhaps, amount to little. But in the language of the courts, I not only demur to the indictment, but join issue on the facts. I deny that these charges are true, and I propose to put them to the test. I am not going to inquire whether there are "ministerial crises once a week and actual change of administration once a month," but whether when the truth is known there is any just ground for wonder or complaint on this score.

The territory of Australia is nearly as large as civilized Europe, that is, Europe shorn of the frozen swamps and penal settlements of northern Russia. This territory is divided into five states possessing parliamentary government, which are politically as independent of each other, and geographically as separate, as the governments of England, France, Italy, Prussia and Austria. The neighbouring islands of New Zealand form a sixth state under parliamentary government; and the political news from these islands commonly reach Europe under the heading of Melbourne or Sydney, the chief ports of departure for European ships, and are confounded by ordinary readers with Australian news. It is easier to reach Paris and even Turin from London than to pass from the capital of any one of these states to the capital of its nearest neighbour. Berlin or Vienna is much nearer to London than the capitals of the colonies lying farthest apart are to each other. But whenever a change is announced in any of those separate governments, half the journals in England, and, it may be presumed, a proportionate number of politicians in clubs and reading rooms cry, "What! another ministerial crisis in Australia—will they never be quiet?" Perhaps they will add, with the *National Review*, "these people have a crisis once a week, and a change of ministers once a month." These criticisms in good time are carried across the ocean, and the colonists feel natural wrath and shame that cultivated men among their own kinsmen persist in making blunders about Australia, which a shepherd in the Australian "bush" would scarcely make with respect to European states.

This is the primary source of the common error on this subject. But it may naturally be asked, whether, after making due allowance on this score, there is not still an inordinate number of ministerial changes in these new states. Let us see whether this is so or not. One of the states, Queensland, has only existed since December, 1859, but during that entire period of six years and a half there has been no change of ministry. Two or three individual members have left the government upon personal grounds, and been replaced by others of the same opinions, but there has been no political or party change whatever. Another of the states, Tasmania, has been under parliamentary government since 1855, but during these eleven years there have been only six administrations. Six administrations in eleven years I may be told are a great deal too many. I can only reply that England is the mother and model of representative governments; the colonies have no pretentions to be better than her in this respect, and in England during the same eleven years there have been exactly six administrations. New South Wales, the senior state, as a distinct colony, and as the seat of parliamentary institutions, has enjoyed responsible government for more than ten years, and it has had till quite recently for its prime minister a gentleman who, if prolonged tenure of office be a merit, may boast of having held that position in his colony for as many of these years as Lord Palmerston held it in England; with such occasional interruptions as even that fortunate statesman did not escape. And his most important competitor has held office during these years twice as long as Mr. Disraeli. But Victoria remains, the most populous, the most vivacious, and the most democratic of the Australian colonies, and the one commonly cited by English critics as the example of all Australian excesses.* For her case it will be necessary to go a little into detail. The constitution by which Victoria obtained the power of changing its government was proclaimed law in the colony in November, 1855. In the ten years and five months ensuing there have been eight administrations. Mr. Haines' administration existed from the proclamation of the Constitution to March 11, 1857—upwards of a year and a quarter. Mr. O'Shanessey's administration, from 11th March, 1857, to 28th April, 1857—only six weeks. Mr. Haines' second administration, from April 28th, 1857, to March 10, 1858—a year minus two weeks. Mr. O'Shanessey's second administration, from March 10, 1858, to October 26, 1859—upwards of a year and a half. Mr. Nicholson's administration, from October 24, 1859, to November 29, 1860—upwards of a year. Mr. Heales' administration, from November 29, 1860, to November 13, 1861—a year minus a few days. Mr. O'Shanessey's third administration, from November 13, 1861, to June 30, 1863—upwards of a year and a half. Mr. McCulloch's administration, from June 30, 1863, to April, 1866—two years and ten months; and it is still in power.

Omitting the purely exceptional case of the first O'Shanessey administration, this gives an average of a year and a half for each government; or, including that administration, we have an average of more than a year and a quarter; not an average of a month, as the *National Review* undertakes to affirm. And undoubtedly one main cause why governments have not been longer lived, is that public men sometimes resigned office too promptly—more promptly, and on less sufficient grounds, than the English practice justifies—because they were determined to keep high the standard of parliamentary responsibility. I may remark, in passing, that both the statesman and the reviewer, to whom I have been alluding, attribute the sudden changes of government which they charge on the Australians to the extension of the franchise. But this is manifestly a mistake;

* I have omitted the colony of South Australia because I am imperfectly acquainted with its public affairs, and because an unfortunate variance in its constitution from the ordinary practice, by which members of parliament accepting office under the crown in Free States are obliged to submit themselves to re-election, has caused a disturbing influence, the effect of which I find it difficult to calculate.

for the only very short-lived administration occurred before the franchise was extended; and in latter years, with an extensive franchise, each government has been longer lived than its predecessor. But a year and a quarter is a miserably short average duration for a ministry, it may be said, and argues, after all, that the colonial parliament has, in the words of the reviewer, "not patriotism enough to give a decent stability to government." The colonial parliament has given precisely such a decent stability to government as the English parliament has been in the habit of giving when it was not mastered by a great popular favourite, or managed by a skilful intriguer. The succession of long-lived English administrations in the Georgian era, commanding undeviating majorities in parliament, belonged to a period when parliamentary corruption constituted one of the chief agencies of government. As soon as the contest of opinion began to be fairly fought in the House of Commons ministries changed repeatedly, or endured only when backed by great popular enthusiasm. The exceptional good fortune of Pitt or Palmerston can scarcely be considered a fair standard to apply to colonial ministers; and the successful devices of Walpole or the Pelhams for tranquillising parliament are not a desirable model to propose for colonial adoption. But, under the ordinary laws of political action, English administrations, since responsible government has existed, were about as long-lived as colonial administrations. Instead of taking up the *Annual Register* for specific dates, I will borrow illustrations from two or three popular sources running through the last century.

The famous *Public Advertiser*, in July, 1766, a hundred years ago, contained a letter bewailing the short life and sudden death of governments in England. This letter is now known to have been written by Edmund Burke. Prior, in his memoirs of Burke, reprints it as his, and it bears evident marks of his strong hand.

"Since the happy accession of his present Majesty, to this day," says the letter, "we have worn out no less than five complete sets of honest, able, upright ministers, not to speak of the present, whom God long preserve. First we had Mr. Pitt's administration, next the Duke of Newcastle's, then Lord Bute's, then Mr. Grenville's, and lastly my Lord Rockingham's. Now, sir, if you will take a bit of chalk and reckon from the 7th of October, 1760, to the 30th of July, 1766, you will find five years nine months and thirty days, which, divided by five, the total of administrations gives exactly one year and sixty days each, on an average as we say in the city, and one day more if they have the good fortune to serve in Leap-year."

Five years later, Mr. Burke, in a speech in the House of Commons on the City of London Remonstrance,* speaking of the previous nine years, returns to this subject:—"During this period, sir, the direction of public affairs has been in no less a number of hands than Mr. Pitt's, Lord Bute's, Mr. Grenville's, the Marquis of Rockingham's, the Duke of Grafton's, and Lord North's, so that, if we were to divide the nine years equally between them, there would be just a year and a half for every separate administration."†

This was the era of the giants; the great age of Fox and Pitt, when, for public spirit and political ability, Parliament was at its zenith. Yet, some rash and censorious critic in the colonies, if he looked with the eyes of the scorner at the mother country, might discern no other moral in its eager contest for political principles, than that it had not "patriotism enough to give a decent stability to Government."

If we leap over the era of the Anti-Jacobins, when opinion was suppressed, and come to the period of real parliamentary struggle which immediately preceded and followed the passing of the Reform Bill, we have the same state of things recurring. Mr. Albany Fonblanque many years ago re-issued a collection of his political writings in the *Examiner*, under the title of "England under Seven Administrations." The selection ranged from 1827 to 1835, during which period, in little more than eight years, the interests of England had been intrusted in succession to the Canning, Goderich, Wellington, Grey, Melbourne, Peel, and second Melbourne administrations. The average duration of a ministry was shorter in England during that period of political activity than it has been in Victoria; but it would scarcely be considered a liberal interpretation of this circumstance if a colonial critic declared that the Imperial Parliament had not "patriotism enough to give a decent stability to Government." It may be said, and it must be admitted, that these short-lived ministries in England belong to periods in some sense exceptional. But do not the short-lived ministries in Australia also belong to an exceptional period? They belong to the period when self-government is first established, and the people are still unfamiliar with its machinery; when the mutual courtesy and forbearance which result from organized parties have only begun to exist; and when great fundamental questions which move vehemently the passions of men are still in course of settlement. It will be observed that the duration of Government has gradually increased in the colonies, as it gradually increased in England; and I submit that, unless men start with the idea that colonies are bound to be in the exact frame of mind and train of circumstances which prevail in England at the moment instead of being in the frame of mind which prevailed in England at something like a corresponding period, there is no just ground for wonder or complaint at the duration of Australian ministries.

It is a curious fact that if the colonies desired to retort the charge of political instability upon England they could make a much more effective case than she can. In 1838 a select committee of the House of Commons reported that one main cause of the misunderstanding between Canada and the home government was the constant fluctuation of men and opinions in the Colonial Office. There were eight new secretaries of state for the colonies appointed in little over ten years, each with a a new policy, more or less differing from that of his predecessor. But so little change for the better did this parliamentary remonstrance produce, that a dozen years ago, when the Australian colonies were negotiating the bases of their new constitutions, they had actually to deal with five separate Ministers holding the seals of the Colonial Office within three years.

Our critics propose to furnish us with a more stable executive in the colonies, nominated no doubt by the mysterious official whom the late Charles Buller named Mr. Mother-country. I wonder whether it is entirely forgotten how that system worked, when men of intellect seriously speculate upon the possibility of imposing it anew upon a million of people, owning a territory as large as Europe, and who have tasted self-government.

The stable executive of old, existing before responsible government was conceded to the colonies, was often recruited from persons of reputation too damaged for promotion in England; and it followed as a natural consequence that they not unfrequently plundered the State by defalcation or by monopolising the public lands. At best they were persons having no necessary sympathy with the community whose interests were entrusted to them, and they were sometimes wantonly and viciously opposed to them. They were so incompetent that, as Mr. Chapman, now a judge in New Zealand, informs us, it was sometimes necessary, even in the torpid and submissive councils, nominated in a large part by the governor, to appoint a spokesman to interpret the policy of the stable executive, which did not contain a single man capable of defending his own measures in debate. But, without going back to the dark ages of colonial misgovernment, is it forgotten what sort of a stable executive was exported to the colonies as recently as the short

* March 16th, 1770.

† Prior's "Life of Burke," p. 155.

interval between the Australian states framing their constitutions and the Imperial Parliament confirming them; not quite a dozen years ago? In the *Times* of August 4th, 1854, one may read these weighty words:— "The neighbouring colonies of Victoria and South Australia will learn that a judge has been appointed to the Supreme Court of the former who had never sat on a seat of justice, and who had compromised himself by corrupt promises to electors; while very soon after a governor has been appointed to the latter colony, in his twenty-ninth year, utterly new to office, and rather too well-known for his dealings on the turf and the Stock Exchange. * * * The colonies must be flattered, both by the general repugnance to their society shown by Englishmen who have anything else to look to, and by the sort of men that we think good enough for their highest offices. They will naturally begin to consider whether the colonies cannot do for themselves as well as we can do for them." The colonies have begun to consider, and ended considering this point, I apprehend. Colonists are rather given to exaggerate their political differences, and to make the most of the sins and shortcomings of their political adversaries, and are answerable, I have no doubt, for much of the misapprehension which exists in England respecting our adopted home; but it has never been my fortune to meet with a colonist who had the smallest desire to replace his free government by the sort of thing which constitutes a stable executive.

It will be admitted, I trust, that there is not quite so clear a case against Australia upon this head as had been commonly supposed. Other ideas which have gathered round this central one are just as idle and exaggerated. "All this perpetual agitation in Australia," an eminent man said to me lately, "is about absolutely nothing that anyone can comprehend." Not quite about nothing. The smallest of the colonies, for example, is a country as large as England and Wales, more fertile and under a far more genial sky, where the public lands have only in a small degree become private property. There were till recently forty millions of acres to dispose of, and the question which most habitually divided parties was the principle upon which they ought to be distributed by the state—in large estates, as in England, or in numerous small estates, as upon the Continent. I do not know what country in Europe had a larger question than this to deal with. Again, I have been asked—Have not the legislatures fallen into the hands of inferior men, and the best men been excluded? Speaking of the entire period over which parliamentary government has existed, I believe that the men most unequivocally competent for the management of public affairs have habitually been in parliament.

It must be remembered that in a new country men of ability have various other works to do as important as the work of legislation. The discovery and development of the wonderful resources of the country; rendering easier the extraction of gold; improving the quality of stock; the planting new industries, and enriching the land with plants and animals which nature has denied to it, are works as urgent as perfecting the laws and institutions. Good men, it is true, are sometimes excluded for a time by a gust of popular passion; but as some of the most eminent men in England lost their seats for opposing Lord Palmerston. A few years ago in New South Wales several able men were excluded on a popular question at a general election; but these identical men constitute the leading members of the present government of that colony. In Victoria at the close of last year several able men were excluded on a question which moved the passions of the people, but they will no doubt re-appear in the same way as happened in New South Wales and in England.

Again, it is said the parliament and people of Australia commit mistakes and run after delusions. Let us say they do; what people of whom we have any knowledge are free from the same charge? Eleven years ago, when I was leaving for Australia, the whole people of England seemed to be in a frenzy of enthusiasm in favour of war on behalf of the Grand Turk. How many of them retain their enthusiasm on that subject at present? In truth the people of Australia are no worse in this respect than any other people; and the mistake consists in setting up an ideal standard of wisdom and moderation for them to which no community can reach. I am far from desiring to prefer any exaggerated or extravagant claims on the part of the colonies. Blame them where they are open to blame, by all means; but be sure of your facts. Blame them where blame is reasonable; but it is not reasonable if the ground of complaint substantially is that Australia is not England. No sensible man will expect absolute identity of views or of practice between the young communities and the old community; he will remember that the colonies are not mere branches of the imperial tree, but saplings from the same root, flourishing in a soil and under conditions of their own which render some modifications of structure inevitable. He will keep in view the fact that he is dealing with states in the second decade of their existence, which had to be organised out of the social chaos created by the sudden association of large masses of men with no previous knowledge of each other, and hardly any common interest beyond the preservation of order. They are in process of growing, and have grown with singular rapidity, but he will not expect to find in the first stage of their growth the gifts and accomplishments which belong only to maturity. A settled public opinion, the reserve of conscious strength and fixed rules of practice in public transactions, are attained by communities only after struggle and discipline. A colonial parliament—the organ of a young, vigorous people—has pressing work to do, and is at that stage of its progress when impatience of delay is natural and healthy, as implying sincerity and earnestness. The House of Commons, in the time of the Stuarts, was in a somewhat similar stage, and passed through a long apprenticeship marked with not a few paroxysms of passion and fits of torpor before it settled down into the effective instrument it has become. No turbulence which can be truly attributed to Australian parliaments, and nothing which malice or ignorance has invented in respect to them, is more than a pale reflexion of incidents in the parliamentary struggle which commenced with John Pym, and is apparently not quite ended yet. Remember this fact always, that England has no longer any interest in colonies separate from the interests of the colonists; and the interests of the colonists cannot have been grossly neglected where public credit has been maintained, where public order has been preserved without interruption, and has been allied with social and material progress, and with individual liberty as perfect as exists anywhere on the earth. But there is a higher consideration which ought to guide English criticism. The Australian colonists possess, and fortunately know that they possess, one of the freest and most serviceable constitutions in existence; but the more universally they recognise the fact, the better and more stable government will necessarily become; for order rests upon public content as its basis. It follows that any criticism calculated to disturb this content ought to be made only upon sure grounds, and that not only wilful, but even ignorant, disparagement of the institutions upon which it depends, by writers or speakers of authority, amounts to a grave offence. The colonial statesman has difficulties to face from which the English statesman is nearly altogether free. In England the bones and sinews which sustain and move the body politic, and constitute the vital machinery of the State, are covered by flowing robes of ceremony, and custom forbids too close an inspection of the august and mystic organism beneath. In Australia you have only the naked ribs and vertebræ, possessed with a vigorous principle of life indeed, but with scarce a rag of traditional veneration to shelter them from inquisitive eyes. Reverence and custom, agents so powerful in the government of states,

can scarcely be said to come at all in aid of authority which has to depend in a large degree upon its intrinsic strength for acceptance and support. It is not surely the part of an English constitutionalist, whether in parliament or the press, to increase the natural difficulties of government under such circumstances. But he does so by unjust criticism, whether he makes the people discontented with its system of government, or only angry at the mother country for the misrepresentation of it. In truth, the maintenance of friendly relations between England and her great colonies has passed from the care of the Colonial Office to the care of public opinion and its interpreters. There are no longer questions of right to determine, and scarcely any question of mutual interest to regulate from which difficulties can spring; but the ties that remain, those of sympathy and kindred, are always highly sensitive. The chief peril lies, I think, in the offensive superiority which Englishmen who remain in England are sometimes inclined to assume over Englishmen who have left England. The Irish and the Scotch, who are an emigrating people, only share this feeling in a small degree. But the question is not one of feeling and sentiment exclusively, but is becoming one of national interests. England interprets between these new countries and all Europe and America, and she is ushering them into the world with the serious impediment of a blemished character. The colony of Victoria, in which I reside, has never cost the mother country a guinea, has never done or wished her anything but good, has exhibited her sympathy in a practical way on trying occasions, has poured upwards of a hundred millions sterling into the coffers of her trade, and may surely expect not to be wantonly injured; and one of her citizens will not be accounted unreasonable, I trust, if he moves for a rehearing of her case upon grounds so sufficient as that the verdict found against her is contrary to the weight of evidence.

DISCUSSION.

Mr. M. H. Marsh, M.P., being called upon by the Chairman, said that for many years he sat in the legislative council of New South Wales, and had had practical experience there, as well as in Queensland, as to the social and political state of the colonies, having also resided for a considerable time up the country. Last summer he made a rapid trip to Australia, and thus obtained recent knowledge of the condition of that country. He would have liked his hon. friend to have expatiated a little more on the social state of Australia, as there was nothing on which there was generally such great misconception in this country. He might say it was precisely the same as in England. He might perhaps mention that on the occasion of his late visit to Queensland they were pleased to entertain him at a public dinner at which nearly 300 were present, and where there were the same evidences of refinement as would be met with here on a similar occasion. The political system of Australia was a subject of deep interest, and it must be understood that if he said anything against that system, it was not intended as a reflection upon the people themselves. In what he might say he was sure he was borne out by most educated men in Australia, because when he was last there he formed his opinions very much from what he heard from them. He could not speak too highly of the beautiful climate of Australia. It seemed to him to have an influence upon the race. The children were more beautiful than in this country, and the climate itself seemed to give the dispositions of the people a genial turn, for nowhere was there more liberality and charitable feeling than in Australia. With regard to the system of Government, however, he could not speak in such high terms. He spoke chiefly of New South Wales, because he was more familiar with that colony. They found their finances now in a most hopeless state. They were out-running the constable in their public expenditure, at the rate of from £400,000 to £800,000 a-year, in a community of about 400,000 people, and though they were trying to recoup themselves by additional taxes, he was afraid they would hardly succeed. In Victoria they found they were going backwards in political civilisation, for they were now quarrelling about free trade and protection—a question which had been long since settled in this country. There was also some little bigotry about national education in that colony; and here he might mention that the only colony that had advanced in education more than any country of Europe or America was Queensland, which was not democratic, where there was no universal suffrage, with its concomitant—the ballot. During his late visit he went from New South Wales into Queensland, and when passing the frontier the change was like magic. He saw better houses; the people looking happier, with wonderful prosperity all around; whereas the colony he had just left had but little advanced. Queensland, under its present government, had perhaps progressed more rapidly than any other community. Six years ago its population was 25,000; it was at the present moment, he believed, 100,000, and the wealth and prosperity of the people had increased in a much greater ratio. The other colonies might all be called prosperous, for Englishmen, wherever they went, would be prosperous; but, of late years, they had not progressed so rapidly, and immigration had almost entirely ceased, whereas in Queensland the population was drawn not only from the mother country, Europe, and Germany, but also from the other colonies. A great deal had been said about the security of property in the colonies. He was a stockholder to a large extent in New South Wales, and he must say that his cows and horses were often stolen with impunity, which could not be regarded as a proof of the security of property. Bushrangers till lately domineered all over the country, and these depredations were encouraged—he did not say by the Government—but by the bad system of police, which was brought about by political jobbery. It was very well for his hon. friend to talk of the safety of property in Melbourne, with a population of 90,000, but let him go up the country and see the insecurity of property which this political jobbery had created. By the same means the very fountain of justice had been polluted. For political purposes persons were appointed magistrates who were totally unfit for the office. When Mr. Martin, the present Prime Minister of New South Wales, came into power a short time ago, he struck out the names of 400 magistrates because they were wholly unfit for their duties, in consequence of which he made himself so unpopular that he was turned out the first week he went to Parliament, but his successor dared not reinstate the magistrates whom he had dismissed. He (Mr. Marsh) had been contradicted in another place in his statement that the members of the Victoria Parliament had been bribed, not by official appointments, but with actual money, from £10 to £750—they were bribed with positive money. He had this on authority which he could not doubt—from men of high station in the colony and in this country, and he thoroughly believed it. He assured them he entertained the warmest and most cordial feeling towards that country, in which he had lived for fifteen years—to its lovely scenery and unrivalled climate—the country where his children were born, where he still possessed property, and where his nearest relatives and dearest friends resided, but this did not blind him to the defects in its political system.

Mr. Duffy begged to be allowed to say one word, lest the discussion should get into a wrong channel. His hon. friend who had just addressed the meeting had applied himself to subjects not contained in the paper. There had been gross imputations cast upon the colonies. He had endeavoured to answer them, and to show that this prejudice was not well founded, but his hon. friend

nd shifted to other grounds so purely political that he was afraid to follow him. He (Mr. Duffy) had spoken mainly of the colony of Victoria. If the hon. gentleman found that in New South Wales the finances were not in good condition, he asked how he connected that with democracy, seeing that nations in Europe which were not democratic were in the same condition? With regard to the corruption of the legislature, if his hon. friend specified any case or gave the names of any authorities, he would endeavour to reply to him.

Mr. Wm. Hawes said there were so many persons present much better qualified to speak on this subject than he was, that but for the silence that appeared to be pervading over this large meeting he would not have ventured to address them. They were all much obliged to Mr. Gavan Duffy for the eloquent and able defence he had made of the institutions of Australia, and they were equally obliged to Mr. Marsh for the manner in which he had pointed out some of the weaknesses in the working of those institutions. Undoubtedly it was a great mistake on the part of Englishmen to be fond of finding fault with that colonial system which had arisen from among themselves and out of their own prosperity and wealth. But that was a feeling which seemed to be inherent in them not only as regarded the colonies, but even in respect of enterprises at home. They were too apt to indulge in censure of the governing body in any of these undertakings, apparently for the mere love of fault-finding; but, after all, this only served to test governments and institutions, and in the end both were improved and benefitted. He thought the hon. gentleman who had favoured them with the paper had somewhat misconceived the sentiments of many Englishmen on this subject. He believed they all admired the Australian colonies; they looked upon them as great and growing countries, whose institutions would progress, and where eventually there would be as sound and healthy a political system as in this country. At home they had still many institutions to reform and a great deal of political delinquency to eradicate; and our institutions, sound and good as they were, had been improved by the influence of public opinion and by the voice of that criticism which his honourable friend appeared rather to deprecate. Let them criticise the colonies as much as they would, but let it be done in good faith and in the spirit of friendship, and from such criticism nothing but real good could arise.

Captain Hart (Chief Secretary for South Australia) said, having arrived in this country by the last mail, this was the first opportunity he had had of addressing a meeting in the mother country, and he was anxious to give an opinion on this subject from a South Australian point of view. Looking at the extent of Australia, there were naturally a great many differences of opinion amongst the inhabitants of the different places, and it had been his experience in his visits to this country to find that people here grouped the whole of these colonies together, and seemed to regard the Australian people as one, instead of being, as in fact they were, several separate communities. His hon. friend Mr. Duffy, whom he knew some years ago in Victoria, was quite aware that on some political matters he differed from him materially, but with a great deal that had fallen from him this evening he entirely agreed. He differed from the hon. gentleman who had opened the discussion. For his own part he believed that with regard to the colony of South Australia, to which he (Captain Hart) belonged, and in which he had spent most of his life, the picture drawn by Mr. Marsh would not apply, inasmuch as they were in favour of free trade in that colony. They imposed no duties beyond those which were necessary for the purposes of revenue. They raised a large revenue, and at this moment, instead of being in a bad financial condition, there was something like half a million of money lying to the credit of the Government. Mr. Marsh had spoken very strongly in favour of Queensland, but he regretted that that gentleman did not visit South Australia, to which the nickname had been given of the "farinaceous village," from the fact of its supplying the neighbouring colonies with that which they could not produce so cheaply—the staff of life. Cereals, to the extent of a million and a-half sterling, were exported from South Australia during the year 1864, and that with a population of only 147,000 persons, men, women, and children. During the same year they exported nearly 80,000 tons of flour. They had always had a revenue in excess of the expenditure, and the public debt at the present moment was only between £700,000 and £800,000, although they had some 60 or 70 miles of railway constructed at a time when labour was very dear. With regard to the political aspect of the country, he agreed with Mr. Marsh that in certain colonies the population was of that roving character that universal suffrage did not work well. It was different in the colony to which he had the honour to belong; and this arose from the fact that two out of every three persons were landowners; while in the other colonies this was not the case. The system of selling allotments of land of eighty acres, at £1 per acre, to all who had the money to buy it, had resulted in a class of yeomanry owning land, and the consequence was that South Australia was a more conservative colony than the others, and universal suffrage and vote by ballot had been successful there. He felt sure it was from the want of this discrimination on the part of statesmen in this country that they were altogether mystified by the various accounts they received as to the different colonies. No doubt Mr. Marsh was correct in saying there was an outcry raised in Victoria for protection, and at present the political state of that colony was not satisfactory; but this was merely a state of transition, and could not be regarded as permanent. He begged to express the warmest sympathy with the colony, with which he was himself connected. He avowed himself a true South Australian. It was the land in which his children were born; he had many dear friends there; and he should go back again to that country, for he felt it was his home.

Sir. J. Gray, M.P., would have been glad to have heard some further observations with reference to the remarks of the hon. gentleman (Mr. Marsh). There were not a few friends of his who were at the present time contemplating emigration to Australia, and he confessed that when he went home and told them of the insecurity of property he had heard of this evening as existing in some of the colonies, he doubted whether they would be inclined to trust themselves or their goods in such a country. He would have liked to have heard whether the experience of other gentlemen on this subject was such as to warrant him in reporting to his friends that, if they had cash or goods, they had better stay at home than go to a place where horses and cows were stolen with impunity. The honourable gentleman appeared to attribute these irregularities to something peculiar in the institutions of the country. Now he had heard of cows and horses and many other things having been stolen in England. Mention had been made of outrages occasionally committed by bushrangers. It was a peculiarly happy circumstance for Australia if only bushrangers perpetrated them, because in this country there were garotte robberies even in the most frequented thoroughfares, and he had never heard that attributed to the evils of the Government or the corruption of the representatives of the people.

Mr. C. Gilpin, M.P. (responding to the call of the meeting), said he had attended rather to listen than to speak, and to his shame he confessed he did not know half as much about Australia as he ought to know; but, although he knew but little about it personally, he had a son in that colony, from whom he monthly received letters conveying information similar to much that he had heard this evening, but very dissimilar in some respects from what had fallen from his hon. friend, Mr. Marsh. He thought they could scarcely over-

estimate the importance of a meeting like this, and he felt personally obliged for the invitation which enabled him to be present on this occasion. He believed his own case was not a singular one—that, in the multiplicity of his other engagements, he had not given as much attention as he ought to that which was of the greatest importance to us as a country, viz., the interests of our colonial possessions, and above all the interests of our Australian colonies. He had listened with deep attention to the very able paper of Mr. Duffy, as also to the remarks that had been made upon it, and he confessed he was not surprised at the earnestness, which met with a half rebuke from the chairman, that prompted Mr. Duffy to get up and explain as to certain charges made by his hon. friend, Mr. Marsh, which were certainly of a most startling character. For himself he would say, in whatever company he was, if he heard it stated that the British Parliament—of which he had the honour to be a member—took, directly or indirectly, money value for their votes, he would warmly contradict it. He did not, therefore, wonder at a gentleman, who had been a member of a colonial parliament, requesting to be furnished with the authority upon which so startling a statement had been made. Nothing he had ever heard from Australia justified him in believing that, to any great extent, such a system prevailed there. If it did it was no more an argument against the constitution of Australia than it would have been against England herself at certain periods of her history, when it was well known that many of her members of Parliament were open to corruption. They should judge of these colonies as they would wish to be judged themselves under similar circumstances, and then he was sure they would all agree that Australia, regarded in that light, would stand as a glorious child of England, of which she might well be proud, and towards which, he hoped, she would always extend the right hand of earnest Christian fellowship.

Mr. J. Brady, M.P., wished to ask his hon. friend, Mr. Duffy, with reference to the Houses of Assembly, what class of men, generally speaking, were returned as representatives, and also what was the relation between the governing bodies of the colonies and the imperial government at home; and whether he considered there was any unjust interference by the latter with the rights and privileges of the colonial legislatures? If those questions were answered in the way he hoped they would be, it would satisfy many minds in this country who were at the present time under the impression that Parliamentary representatives in these colonies did not belong to a class suitable for such a position.

Mr. Duffy said he had great pleasure in replying to the questions just put by his hon. friend. In the first place, as to the class of men elected as the representatives in the parliament with which he was most familiar, and generally in the Australian parliaments, he might put it to the meeting whether the two gentlemen who had addressed them, Mr. Marsh and Capt. Hart, who had both been members of colonial legislatures, did not fairly represent the class referred to. He might go further and say he believed there had been only three members of the colonial legislature in the House of Commons here, two of whom Her Majesty had thought fit to select for offices in the government. It was true that in a new colony, where there were great industrial interests, the class of men must necessarily be different from those selected here. Many useful members of the colonial legislature would be very much out of place in the British House of Commons, but were, nevertheless, extremely useful men for the community with which they were connected. As to the relations between the colonial government and the home government, he had always regarded that question in this light—the governments of any colonies preserving their connection with the Crown were, within their own territory, as free to deal with it as the parliament and government of this country were to deal with the affairs of this nation; and in that respect they owed no allegiance whatever to the government in Downing-street. It would be hard, as it seemed to him, if the policy of a state were made to depend upon the decision of a body where it had no representative, and where it had not a single vote. Of late years the Colonial Office had taken the (as it appeared to him) discreet course of interfering with the colonies as little as possible. Latterly the only cause of complaint was the attempt made to send convicts to Australia. That question was dealt with in a somewhat weak manner by the colonial Parliament, in the shape of entreaties and protests, but he (Mr. Duffy) admired the spirit of one distinguished gentleman in the colony, who said, "If they persist in sending convicts here, I will begin by a large contribution to a fund, which other people will be sure to unite in, to send them back to England again!" And this settled the question. The only power at present exercised by the imperial government with respect to colonial legislation was the power of vetoing bills, and he ventured to say that before long that objectionable system must be abandoned.

The Chairman, in rising to propose a vote of thanks to Mr. Duffy for his admirable paper, remarked that it always seemed to be a very easy task for any one who had been in a foreign country to give an account of anything he had seen there, but in truth the task was a difficult one, because they could only see such matters through the mind's eye of the individual, and he was afraid that was a badly constructed lens, which was apt to distort that which it saw and give a false colour to it, and hence every one came back from foreign countries giving different versions of every thing that had come under his notice. In Australia one could understand that there was great scope for [illegible] unlimited variety of views and opinions, because [illegible] colonies there had been of the most rapid growth, [illegible] they had not yet shaken down into that definite [illegible] and purpose which were found in older societies. [illegible] they were not the less entitled to respect, and [illegible] to be held up to contempt because they did not [illegible] those settled features which characterised older communities. The life of a nation was not to be counted by [illegible] but rather by centuries; and it was to be recollected [illegible] it had taken seven or eight centuries for this country [illegible] arrive at the condition it so much prided itself [illegible] It was difficult to form an opinion of the state of [illegible] in these colonies, because people were apt to generalise too hastily from imperfect observation; and it must be remembered that they consisted of several separate communities, differing materially from each other. People spoke generally of Australia as a whole, forgetting [illegible] extent. A remarkable instance of a mistake of a similar character, with regard to England, had been told him [illegible] a friend who had travelled in the backwoods of America. An old settler there—not an emigrant—had been accustomed to see an immense map of the United States, [illegible] had also seen a map of the world, with a little dot on [illegible] outside of Europe which represented Great Britain. The result of this was that the man came to the conclusion —seeing London marked on one side and Bristol [illegible] the other—that Bristol was a suburb of London, [illegible] that England itself was one great populous commercial city. This was the illusion created by seeing places [illegible] an immense distance. He had no doubt his [illegible] friend (Mr. Marsh) had been in some parts of Australia where sheep were looked upon as being somewhat [illegible] common, but as compared with the whole of Australia this might be only an exceptional case. Therefore they must not think there was a want of truthfulness in the remarks made, or any real contradiction in [illegible] opinions expressed. Every person spoke from what he had himself seen, and from his own point of view, [illegible] that was not always in accordance with another point of view even of the same thing. They were greatly indebted to Mr. Duffy for contributing something to the general stock of information on this great and complex question; and he was sure all present would participate

in the feeling that nothing could be more useful to this country, as the parent of our colonial empire, than to have the best information that could be procured as to the state of these important dependencies. But another claim to their thanks existed in the present instance, in the good spirit that prevaded the paper, and the evident desire to promote a good understanding between the colonies and the mother country. If allusion had been made to circumstances which might provoke ill-feeling, it had been done only to correct the false impressions out of which such feelings arose. The whole spirit of the paper was such as to commend it to their admiration, and he was sure the meeting would cordially concur with him in giving Mr. Duffy their thanks for having read it.

The vote of thanks was then passed and acknowledged.

Proceedings of Institutions.

HASTINGS MECHANICS' INSTITUTION.—The report presented to the annual meeting held May 2nd, 1866, speaks of the prosperity of the Institution. The following classes have been in operation during the past session:—Senior French, junior French, and arithmetic. The yearly competitive examinations have just taken place for the prizes offered by the committee. The attendance of the classes has been satisfactory. The committee impress the importance of the examinations connected with the Society of Arts on the members of the Institution. They have reason to congratulate their members on the result of the examinations of last year. The following lectures have been delivered during the winter:—G. Buckland, Esq., musical entertainment; T. Brassey, jun., Esq., "Changes in Naval Warfare;" G. Dawson, Esq., M.A., "Richard Cobden;" Mr. John Banks, V.P., "The Solar System;" Rev. W. Barker, "Sense, Reason, and Faith;" W. D. Lucas-Shadwell, Esq., "Battle Fields of England;" Mr. A. H. Wood, "Coal;" Hon. G. Waldegrave-Leslie, M.P., "Turkey and Greece;" Mr. J. E. Butler, "Pneumatics;" Mr. J. Banks, "Oxygen and Hydrogen;" T. Brassey, jun., Esq., "Naval Warfare;" Elihu Burritt, Esq., "Higher Law and Mission of Commerce;" George Grossmith, Esq., "Sketches of Life and Character from the Modern Humourists;" Rev. J. A. Hatchard, "Reading;" Rev. A. Reed, "William the Silent." Three thousand and fifty-three volumes have been in circulation, and 62 volumes of new books have been added to the library during the past year, at a cost of £16 7s. 4d. During the year 190 have joined and 125 have left. The present number of members is 354, or a gain of 65 during the year. The committee express an opinion that the practice of some members in withdrawing during the summer is unfair to those members who bear the burden of the entire year, as the small sums received from them in the winter would not be sufficient to keep up the lecture course and the other arrangements during the twelve months. The committee refer to their connection, during the past year, with the St. Leonard's Mechanics' Institution, believing that the true interests of both Institutions lie in unity of action. They are also pleased to report that there remained a surplus to divide between the two societies after each of their three co-operative attempts, on the occasion of the regatta fête, the soirée, and the conversazione. It will be a matter for discussion whether they cannot also unite for the purpose of furthering their respective usefulness in the matter of class instruction, &c. The receipts have amounted to £255 12s. 9d.; and there is a balance in hand of £81 2s. 11d.

PARIS UNIVERSAL EXHIBITION, 1867.

Meetings of the intended metropolitan exhibitors in classes 19, 24, 25, 26, and 44 have taken place at the Society's house since the last announcement, and subcommittees have been appointed for the allotment of space amongst the claimants in each class.

Fears have been expressed in many quarters that the proposed exhibition will not take place at the appointed time; the magnitude of the works connected with the building was one cause of these doubts, and the expected war another. As regards the latter cause, it is to be hoped that the efforts of the neutral powers will succeed in removing it altogether; but even should Germany and Italy go to war, it is said that the French Imperial authorities have decided, on principle, that the Exhibition shall be proceeded with, according to the programme. As regards the other question, the completion of the building, it must be remembered that, the greater part of the structure being of iron, a vast deal of work has to be done before much appearance is made on the ground. The work is, however, progressing rapidly; the whole of the underground work has been completed for some time, the drainage, ventilating passages, and cellars are finished as regards their main construction; those which underlie the building are covered in, and the vaulting of the remainder is now proceeding rapidly, the system adopted being that of vaultings composed of a kind of concrete, on the plan known by the name of *Béton aggloméré*, and which has been employed for the vast underground works of the new caserne now in course of erection near the Palais de Justice, and in many other public buildings. It has already been described in the *Journal*, with the exception of the composition of the concrete itself, which the inventor keeps secret. The iron work is being executed by five large firms, and 70 per cent. of the whole is said to be ready. The erection of the building has been proceeding now for some weeks, and portions of the three great divisions or zones of which it consists are now sufficiently advanced to give a good idea of the whole. The outer zone includes the great machinery court or gallery, as it is called (there being no galleries in the ordinary acceptation of the term), together with the smaller galleries, on each side of which the frameworks serving as buttresses or lateral supports to the great gallery, are almost entirely of wrought iron, all the pillars, and most of the girders and beams being made of plate-iron riveted; of this very striking portion of the building more than fifteen pairs of the huge pillars, each 82 or 83 feet high, are in place, many of the girders and tie beams, and some portions of the iron roofing are also completed, together with the pillars and lattice girders of the two lateral courts with the piazza on the outside towards the garden, so that the profile and curves of this striking feature of the new exhibition building are now clearly designated, and present a remarkably noble appearance. The inner zone of the building, which is to be devoted to the fine arts and to the history of labour, or the retrospective museum, is composed of solid walls of masonry, with an iron and glass roof; a large portion of the stone work is now done, so that the disposition of the picture and other galleries, and the outline of the central garden, are now well marked out. Between these two zones are the intermediate galleries, which consist of iron and glass roofs, supported by cast-iron columns; these are progressing in the same ratio as the rest, so that a portion of each section of the building, in fact, a small quadrant of one of the circular ends, is complete, as far as regards the framing. Every day makes a sensible difference in the appearance of the works, which, considering their magnitude, advance with great rapidity. The grand gallery, which is by far the most important part of the work, is in the hands of three firms, MM. Gouin and Co., Cail and Co., and Joret, and is being proceeded with from three different starting points.

The works in the park or grounds which surround the building, including the portion devoted to horticulture, floriculture, and the exhibition of fresh and salt water fish in immense aquariums; the canals, reservoirs,

and ponds are also advancing steadily. There are eight or nine hundred workmen only engaged at the present moment on the works, but the number is to be increased to five thousand as soon as the frame work is a little more advanced, and the other portions can be commenced with advantage. The Commission is pursuing the work with vigour and determination, and it is therefore but just to say that there is no reason to believe that it will not be completed in good time for the purpose intended.

Notwithstanding the extent of ground to be occupied by the building and its surrounding park, the necessity for more space has been felt, and it is said that the Imperial Commission has taken a large plot of vacant ground, which is to form an annexe to the Exhibition and be devoted to agriculture. It is added, moreover, that a very considerable portion of this new space will be devoted to British exhibitors.

Another new department to be added to the Exhibition is one for pleasure boats of all kinds and the industries connected therewith. A piece of land between the Champ-de-Mars and a port or landing place adjacent, the former of 420 and the latter of 500 square mètres in extent, are to be devoted to this purpose; and it is proposed to have regattas and nautical fêtes during the time of the Exhibition. M. G. Benoît Champy is appointed president of the committee of the section. It is said that France possess 4,696 pleasure craft of various kinds, employing 5,776 sailors and amateurs.

Belgium has announced her intention of contributing her share to the retrospective museum, or historic gallery of labour, and a sub-commission has been appointed for that special section of the coming exhibition. The sub-commission consists of four members of the Royal Commission, with the Keeper of the Royal Library, M. de Brou, a member of the Commission of the Royal Museum of Painting and Sculpture, an eminent numismatist, the Keeper of the Royal Museum of Antiquities, Armour, and Artillery, and one of the Council of the Schools of Design. The rich and curious productions of the Flemish art-workmen of the middle ages will no doubt furnish a most interesting collection of ancient art. The same section is to be enriched, it is said, with important contributions from Greece, whose productions form a curious contrast to those of the low countries.

Amongst other objects of interest promised from America are models, or maps in relief on a very large scale, of all the chief towns in the United States.

The Viceroy of Egypt is said to take a deep interest in the Exhibition, and to have taken measures to render the contributions from his dominions as complete as possible. Amongst other things promised are a reproduction of one of the most complete temples of ancient Egypt; an immense map, in relief, of the country; a selection of the most remarkable objects from the museum of Boulag; and a series of figures presenting the various classes of the inhabitants of modern Egypt dressed in their native costumes.

The Patriarch of Jerusalem will, it is said, contribute some interesting illustrations of biblical history; Persia a series of ethnographical costumes and a collection of stones from the famous mines of Topaz; and Turkey, amongst other things, a complete collection of the historic medals struck at the mint of Constantinople.

THE COAL QUESTION.

Messrs. *Travers' Circular* has the following remarks on this subject:—

Recently the question of the coal supply has been forced on the attention of the tax-payers, both by the theoretical arguments of Mr. Mill, and the practical proposals of the Chancellor of the Exchequer in favour of some attempt being made to reduce the national debt. What are the reasons for thinking that the coal supply is, at our present rate of consumption, speedily exhaustible? And, in the second place, what is the exact nature of the results predicted by the writers who have studied the subject? To begin with, by the diminution of the coal supply is not meant the consumption of all the coal in the island. The argument turns on the probability that, though it may be physically possible to drive coal-mines as deep as 5,000 or 6,000 feet, it will cease to be commercially possible. We are not at all likely to be stopped by what is called "the physical limit of sinking." The alarmists, using the term without any reproach, do not pretend that we are anywhere near our lowest coal stratum, nor that the increasing temperature, as we get lower down and nearer the earth's centre, will eventually prove a fatal obstacle to human workers. "But," in the words of Mr. Jevons, whose book on the coal question is now the text-book for his own side, "the cost of sinking and working deep pits is quite another matter. The growing temperature will enervate, if it does not stop the labourers; much increased ventilation will be a matter of expense and difficulty; the hardening of the coals and rocks will render hewing more costly; creeps and subsidences of the strata will be unavoidable, and will crush a large portion of the coal, or render it inaccessible. . . . . In addition to these special difficulties, the whole capital and current expenditure of the mine naturally grows in a higher proportion than the depth. The sinking of the shaft becomes a long and costly matter; both the capital thus sunk has to be redeemed and interest upon it paid. The engine powers for raising water, coals, miners, &c., rapidly increase; and, beyond all, the careful ventilation and management of the mine render a large staff of mechanics, viewers, and attendants indispensable." That is to say, the deeper the mine, the more subsidiary labour is required; the more costly the general management and superintendence, the more fiery, and therefore the less effective and more dangerous the working. The obvious and inevitable consequence of all this will be a gradual rise in price; and this rise in price, as it is the symptom of a gradual exhaustion, will be the occasion of all the calamitous effects of that exhaustion upon the national welfare. It may asked here whether, up to the present time, the effect of increased depth has been an increased cost of coal. Mr. Jevons maintains that it has. The deep pits are only undertaken in search of the finest household coals; only the high price of the finest coal can remunerate the capitalists for working these mines. These high prices afford "a rough but sure indication" of the effect which depth has upon cost. The price of coal from the deepest pits is the measure of the price that will eventually have to be paid for ordinary coals. "When the general depth of coal workings has increased to 2,000 feet, little or no coal will be sold for less than 10s. per ton, and the choice large coal will have risen to a much higher price." That is to say, in all these industries into which coal enters, all industries connected with iron or with general manufactures, the capitalist will have to work under the disadvantage of a double cost of fuel. "And when with the growth of our trade and the course of time, our mines inevitably reach a depth of 3,000 or 4,000 feet, the increasing cost of fuel will be an incalculable obstacle to our further progress."

But may we not import coal in the same way as we import any other raw material? One has been so long and so thoroughly accustomed to this way of looking at things, that there is nothing to wonder at in the readiness with which people, when frightened about the evils of posterity, have flown to this solace. We import, it is said, tin and lead and copper, after using up our own ore; we import timber, to make up for the deficient supply from our own forests. Why should we not reverse the coal trade in the same way, and after exporting coal to the vast extent we do now, get a future return? Because the very circumstance which enables us to reverse other trades, by the importation of their raw material, is the fact that we possess such an abundance of what is by

far the most important raw material of all—coal. We pay for all this other raw material, we preserve "the reciprocity of trade," by our coal, and in two ways. We export it in its crude shape to the extent of very nearly nine million tons a year; and, secondly, we pay by manufactures which represent a certain consumption of coal, and which foreigners take from us, because they can get the finished article cheaper from us than if they imported from us the required quantity of coals, and then made the article for themselves. "The coal exported acts as a makeweight, to remedy in some degree the one-sided character of our trade. . . . . . To import coal as well as other raw materials would be against the essentially reciprocal nature of trade." This is the general argument. Let us look to particular facts. Suppose that we were dependent on America for coal, and suppose—what is absurd—that the present demand for coal were to continue stationary. "About 1,200 colliers of the size of the *Great Eastern* would be required to maintain our present supplies only." The united tonnage of this fleet of steam vessels, of whatever size, "would be at least five times the whole of our tonnage now employed in every trade and every part of the world." London cannot be supplied with coals now at less than 20s. per ton. Could coal from America possibly reach us at this price, or anything like it? "Our industry would then have to contend with fuel, its all-important food, eight or twelve times as dear as it now is in England and America." The practical conclusion from all this is that our present progressive condition will not continue. Our great supremacy in manufactures will gradually diminish, and eventually change into a distinct inferiority. At present our excess of population emigrates, and having emigrated, demands the products of our manufacturing industry. Take away the coal, on which our superiority in manufacture so materially depends, and this process to which we have been, and now are, so enormously indebted for our commercial greatness, may come to an end. The social revolution which would ensue upon the decay of our manufactures appears to the imagination of such an astounding magnitude and complexity that we may well be excused from even hinting at its probable direction here. The more important question is, what we can do by anticipation to meet or soften a result which may be a-head of us. The first notion that presents itself is to levy a tax on the exportation of coal, or even to prohibit exportation. But, owing to what Mr. Jevons points out as "the peculiar relation of coal to our shipping interest, a tax on exported coal would be paid "through and to the discouragement of our navigation; it would be equivalent to a duty on outward tonnage." And in this way:—Coal is now carried out as ballast or make-weight, and is subject to the low rate of back carriage. The more we import, there must be an increasing surplus of inward freights, and an increasing demand in proportion for outward ballast freights. The coal thus taken out has to compete with the fuel of the parts to which it is taken. The freight and the price have to be lowered until the competition is successful. Suppose you put on a 4s. coal duty per ton, the ship-owners would receive 4s. less on the freight. The consequence would be a corresponding rise in the inward freight, which the consumer would have to pay in the increased price of the foreign commodity. It may be said that this increase of price would represent the help given by the present generation to the next; we are willing to pay more for our imports in order that we may have more coals. True, but we are helping them in the most expensive way, because we are doing something to discourage the shipping interest, and that carrying trade on which, it may be, our future prosperity may mainly rest. Compare with this the assistance we should be giving by reducing the national debt. "An annual appropriation towards the reduction of the debt," as Mr. Jevons says, "would serve the three purposes of adding to the productive capital of the country, of slightly checking our present too rapid progress, and of lessening the future difficulties of the country." It may be noticed that this does not in any way affect the 11th clause of the French Treaty, by which we undertook to let France have our coals duty free for ten years. Nor does it in any way discountenance all these minor provisions for checking the wasteful consumption of coal at the pit's mouth, or by the non-economisation of smoke, cinders, and so on. The entire subject is full of interest, and has been happily brought under notice at a time when the Chancellor has undertaken the gigantic task of paying our debts, a by no means popular undertaking. It is to be hoped that with the knowledge of our utter incapacity for estimating the changes that are likely to befal us even in the present time, the fears that appear simultaneously to have presented themselves to so many minds, as to the commercial condition of our great grandchildren, may be proved to have been somewhat exaggerated. It is a part, however, of our national character, in which self-confidence forms so excellent an ingredient, that we can undertake the management of affairs two centuries hence, and console ourselves by an apparent sacrifice to principle. At least we cannot go far wrong in paying so moderate an instalment of the heavy debt that encumbers us.

THE COPPER TRADE.

The following remarks on the position and prospects of the copper trade in England are by Messrs. Vivian and Younger:—

The total production of fine copper in the world is, on good authority, estimated to be at present 90,000 tons per annum, of which more than 48,000 tons are exported from Chili, as is shown by the following table of exports from thence during the past twelve years, viz.:—

	Tons.
1854	15,797
1855	20,250
1856	21,938
1857	25,498
1858	30,470
1859	28,250
1860	36,289
1861	38,371
1862	43,109
1863	32,540
1864	47,500
1865	48,372

The production in the United Kingdom reached its maximum in the year 1856, since when a large falling off has occurred, the yield at present being only about half of what it was in that year. The Government tables for 1865 have not yet been published; but, as we know that the mines of Devonshire and Cornwall (which form three-fourths of the total production of the British Isles) yielded last year 9,750 tons of fine copper, against 10,050 tons in 1864, we are able pretty accurately to estimate the total production of the United Kingdom for 1865, and we put it down as equal to 1864, say 13,000 tons. The figures for the last twelve years will then stand as follows:—

	Tons.
1854	19,899
1855	21,294
1856	24,257
1857	17,375
1858	14,456
1859	15,770
1860	15,968
1861	15,331
1862	14,843
1863	14,247
1864	13,302
1865	13,000

The yield of the Cornish and Devon mines for the first quarter of 1866 is put down, according to the *Mining Journal*, as 2,220 tons, against 2,498 tons during the same period of 1865, which goes to confirm the steady decline in production as exhibited in the foregoing table.

The other European production, though in the aggregate of considerable importance, seems, as far as we can ascertain, to remain about stationary, and may, therefore, be considered to occupy a neutral position with reference to the broad question of supply and demand.

The yield from Australia (which is directed exclusively to England and India) has lately averaged about 5,000 to 6,000 tons of fine copper, and the richest mine there (Burra Burra) has become poor, so that altogether the above rate of supply is with difficulty maintained, the tendency being rather towards a decrease in production. The yield at the Cape of Good Hope, though progressive, is at present much too small to have any bearing on the price of copper.

Taking the world's production, as previously stated, at 90,000 tons per annum, Great Britain works up about two-thirds of the whole, viz., 60,000 tons, of which she exports about 37,000 tons, retaining the remainder for home consumption; the quantity for these two requirements, taken together, having doubled itself during the last ten years. The annual increase of consumption of copper in the world is estimated as 8,000 tons, and there is no reason to believe that it will not continue at the same rate.

The principal country to which copper is exported from the United Kingdom is India, and the following table will show the falling off which has taken place during 1865.

Exports of Copper and Yellow Metal to Bombay, Calcutta, and Madras.

	Tons.
1863	14,226
1864	15,764
1865	9,453
First quarter of 1864	2,328
" 1865	3,663
" 1866	1,304

The falling off in export of coal from England to Chili will be shown by the following table:—

	Tons.
Dec. 1865 and Jan. 1866	11,000
Feb. 1866	4,000
March 1866	3,250
Four months	18,250

	Tons.
Dec. 1864 and Jan. 1865	17,000
Feb. 1865	8,500
March 1865	7,200
Four months	32,700

exhibiting a decrease of 14,450 tons during four months, or at the rate of 43,000 tons per annum.

ON THE POISONOUS CHARACTER OF NITRO-GLYCERINE.

In the "Hanoverian Journal for Practical Surgery and Medicine" (*Zeitschrift für praktische Heilkunde und Medicinalwesen*, *Hannover*, 1866, *Heft. I.*) there is an article by Mr. B. Schuchardt on the injurious effects of nitroglycerine upon men and animals. Among the higher animals he found that it acted chiefly on the brain, and in large doses caused death. In order to study its effect upon himself, the author took one drop at 10 a.m.; five minutes after great giddiness came on, accompanied by weakness of sight, headache with throbbing in the temples, weariness, sleepiness, strong aromatic taste in the mouth, a burning feeling in the throat, and pain in the region of the heart. An hour later, whilst incautiously endeavouring to take some nitroglycerine out of a bottle by means of a tube, he received a considerable quantity in the throat. Although he spat it out at once, and rinsed out his mouth with alcohol, he felt the above-described symptoms return, so that he was obliged to go to bed. He then fell into a half-senseless condition, which lasted some hours, and left behind a violent throbbing headache, with sensitiveness to light, giddiness, and trembling in the whole body. At first a feeling of warmth spread over the whole system, and the pulse increased in speed, later a feeling of cold came over him; besides this, there was a burning sensation in the region of the heart, and nausea, but no vomiting. On the following day every symptom of poisoning had disappeared. There was no sign at all of convulsions.

When applied externally, nitroglycerine produces no effect at all; to have any action it must be absorbed into the blood. This seems to show that its poisonous effects are due to the products of its own decomposition. Perhaps protoxide of nitrogen is set free in the blood. As the blasting oil has the property of penetrating through organic tissues in a very marked manner, it is easy to understand that workmen handling the material should get headaches by absorption of it through the skin. As nitroglycerine is not volatile, no action through the lungs can take place.

As the excellence of nitroglycerine as a blasting material is sufficiently proved, it will not be long before it finds a wide application. Then will come the question whether its poisonous properties are not so considerable as to forbid its employment. The author of the article referred to believes, from his researches, that this is not the case. Experiments on animals have shown that, to cause death, comparatively large doses are necessary. It is true that upon man small quantities produce decided symptoms of poisoning, but, even after a somewhat large dose, these were not of such an alarming character as to cause any apprehension of a fatal termination. The author got about a hundred drops in the mouth and swallowed at least ten. Violent symptoms of poisoning came on, but not such as to cause anxiety about his life. In the arts and manufactures far more dangerous poisons are employed, such as phosphorus, cyanide of potassium, and corrosive sublimate. However, in consideration of the injuriousness of nitroglycerine, some precautionary regulations for its manufacture and sale should (in the author's opinion) be adopted. Besides this, workmen should be taught the dangerous nature of the blasting oil, in order to prevent their injuring themselves by carelessness in handling it. If these means were taken, it is thought that nitroglycerine would scarcely be found more injurious than any of the other poisons used in the arts and manufactures.*

Fine Arts.

Fine Art Establishments in Belgium.—The kingdom of Belgium is one of the busiest in the world, not only with respect to material, but also to artistic industry and the fine arts. Considering the extent of the resources of the country, the amount devoted to the encouragement of art is extremely magnificent. The budget for the year 1867 is in excess of that of the current year by about four thousand pounds. The fund for the assistance of young artists showing proof of talent is increased from 10,000 to 15,000 francs; that for the encouragement of line and

* The *Borggeist* has lately noticed several cases of the spontaneous decomposition of nitroglycerine, accompanied by more or less violent explosions. According to Nobel, this can only happen with nitroglycerine which has not been fully purified.

medal engraving, from 20,000 to 30,000 francs; the vote for the execution or purchase of works of art is raised from 60,000 to 100,000 francs; a further sum of 25,000 francs is devoted to the acquisition of works of Belgian artists only; the sum of 15,000 francs for the purchase of contemporary works for the completion of the museum of modern art at Brussels; the vote for the encouragement of schools of design is increased from 75,000 to 100,000 francs; 2,000 francs are voted towards the establishment of an atelier for restorers of pictures in the Academy of Antwerp; and 4,000 francs for the publication of an illustrated edition of the catalogue of the museum of antiquities. A private society has just established at Louvain and Malines workshops for the re-production of objects of religious art.

Manufactures.

Iron Oxide Paint.—Mr. Calley, of Torbay, has invented a paint for iron structures, in the composition of which it appears that oxide of iron instead of lead is employed. Mr. William Humber, speaking of this paint, says:—"Notwithstanding the great importance of preserving iron structures from decay, it is sufficiently evident that chemists have not kept pace with the times; in all directions the use of iron has increased in an almost incredible degree; and yet some of our noblest structures are almost been condemned to decay for the mere want of attention to the composition of paints or coatings capable of protecting iron from oxidation; thus, for instance, it is well known that no less than twenty tons of rust have been collected from the Britannia-bridge, and, in all probability, an equal amount has accumulated or fallen away unnoticed and unnoticed. If lead paints are applied to iron, it will be observed that the iron will usually oxidize beneath the lead coating, and gradually detach it, so that it will scale off, not through its own deterioration, but will be found to be as good as when first applied, but simply by the mechanical action of the ferruginous scale upon it." This, however, is stated not to be the case with the iron oxide paint, "for," says Mr. Humber, "not only is the iron coated with this paint preserved, instead of being deteriorated, but the paint is in itself cheaper than lead paint, as, from the facility and tenacity with which it adheres, a larger surface is covered by a given quantity of this composition than an equal amount of lead would suffice for." The paint is said to have been used with success in the Government dockyards and elsewhere.

Fastening Driving Tyres Without Heating.—Mr. Griggs, of the Boston and Providence Railway, has a method of putting on driving tyres without the use of heat, that seems to be very simple and very economical. The American *Railway Times* says the wheels are of cast iron, cast with dovetailed recesses on the outer rim, and the tyre is turned out so as to slip easily over the whole. After the wheels are fastened on the axle, the tyre is put down over the wheel, and a quantity of wooden blocks about 3in. wide, 1½in. thick, and a little longer than the width of the tyre, are placed in the recesses between the wheel and tyre, and driven down carefully by a sledge hammer until the requisite strain is attained. These wooden blocks are made of thoroughly seasoned walnut or elm. When once driven home they are said to hold the tyre so firmly in place, that there is no necessity for otherwise securing it, though there is no objection to other fastening if it is desired. The time occupied in putting on one of these tyres is about twenty minutes, and only three men are required to do the entire work. All tyres on the Boston and Providence road have thus been fastened for the year past. Either steel or iron tyres can be thus treated, and Mr. Griggs has both kinds running, which were put on in the same way.

Commerce.

Coffee at Penang.—The *Penang Gazette* says that the attempt to grow coffee in that district has not been so successful as was originally anticipated. "During the last four or five years coffee planting has had a pretty fair trial in Penang, but the conclusion arrived at is that coffee culture will not pay there, in fact that it is nearly a complete failure. The plants, during the first twelve or eighteen months, grow well and are strong enough, but as soon as they commence bearing, and when the long droughts set in (which by the way we have had for the last three years), the plants become scraggy, lose their leaves—partly through drought and partly through the ravages of insects—and eventually die. In a rich soil, and under a shade, the plants stand better, and do not appear to suffer much from insects, but the crop is inferior in quantity, and except near dwelling houses, the cultivator has a small chance of reaping any harvest whatever. These remarks apply especially to the plain; the plants on the Great Hill still bear, but their extension seems bounded to the present localities round the bungalows."

Cotton Trade in Spain.—The chief manufacturing interest, says Mr. Sackville West, in his *Commercial Report* for 1865, consists in the cotton manufactures of Catalonia, a local interest which has hitherto succeeded in resisting all attempts on the part of the Government to modify the existing rates of duty. This industry employed about 100,000 people in 1861, and there were 1,000,000 spinning machines in work. During the five years ended 1860, Barcelona imported cotton as follows:—

	United States.	Brazil.	Venezuela.	Porto Rico.
	Bales.	Bales.	Bales.	Bales.
1856	124,968	21,092	1,305	1,169
1857	72,376	9,913	..	28
1858	92,578	10,620	916	676
1859	108,156	3,711	148	15
1860	110,283	4,547	344	..

The importation in 1863 fell off to 105,920 bales, and the subsequent depression of the trade was most severely felt in this province, although the mills were kept open by supplies, from Marseilles and Cette, of Levantine and Egyptian cotton. The British trade with Barcelona, which may be considered the commercial capital of Spain, has gradually fallen off, and, with the exception of coal and machinery, the imports are small. The great trade consists in smuggled French goods, which are introduced under Spanish marks, and such is the influence of those concerned in this trade, and such the fear which these provinces inspire by their revolutionary tendencies, that, as I have before remarked, all efforts to modify the existing, almost prohibitory, tariff have proved of no avail. If this system could be abolished, both the interest of the smuggler and he who supplies the smuggled goods would cease, and a fair market be opened. The whole country is affected by a system based upon fraud and venality. Its demoralizing effects are everywhere apparent, and the financial condition of the government is seriously compromised by it. These facts are recognised by all intelligent Spaniards, who, however, assert the inability of any government, under existing circumstances, satisfactorily to deal with them. The political organisation of parties is such that any serious consideration of the subject of commercial reform would not only create alarm, but produce divisions which would render it impossible to carry on the government under such circumstances; all that can be looked for is a gradual relaxation of the system, and perhaps an appreciation of the advantages arising therefrom, which sooner or later will awaken the nation to their true interests.

Liverpool Coal Trade.—Messrs. Higginson and Co.'s *Export Coal Circular* gives a statement of the export coal trade of the port of Liverpool during the past eleven years, showing also the increase of the coal trade at Birkenhead by rail during the same period, and the quantity exported from there, separate from that shipped on the Liverpool side of the river. The quantities during the years 1860 to 1863 are estimated as regards Birkenhead, but are believed to be nearly correct; for 1864 and 1865 the accounts have been kept separate. There have been exceptional causes at work during the past year to cause the exports from the Mersey to fall off, as compared with 1864, a large quantity of tonnage usually loading at this port being locked up in Eastern ports for want of cargoes to bring them home. This has therefore taken much of the business that would have been done at Birkenhead to the East Coast and Severn ports. There has also been a great falling off in the quantity of South Wales coal exported from Birkenhead in 1865 as compared with 1864; the decrease being somewhere about 30,000 tons, the requirements for blockade running steamers at Nassau, Bermuda, and elsewhere having ceased early in 1865.

Year.	Tons of coal brought to Birkenhead by rail.	Tons of coal exported from Birkenhead.	Tons of coal exported from Mersey, exclusive of Birkenhead.	Total foreign exports from the port.
				Tons.
1855	178,368	..	..	406,561
1856	211,815	..	..	415,036
1857	276,352	..	..	499,173
1858	253,061	..	..	467,478
1859	309,683	..	..	564,947
1860	236,667	144,000	450,040	594,040
1861	291,015	190,000	434,549	624,549
1862	356,802	230,000	379.748	609,748
1863	428,478	248,956	337,777	586,733
1864	525,665	313,398	433,444	746,842
1865	486,505	227,348	389,628	616,976

Colonies.

Telegraphs in New South Wales.—The only line of telegraph in course of construction in the arrival of the last advices was that between Deniliquin and the South Australian boundary, which, when completed, will place the capitals of the two colonies in direct communication. That portion of the line between Deniliquin and Moulamein, being a distance of 65 miles, has been completed. The station will be in the centre of a pastoral district. When the line shall have been completed and opened to Balranald, a further distance of 45 miles, a still more important portion of the district will be opened to telegraphic communication. The work was being pushed on, and will, it is anticipated, be completed within the contract time. The people of Burrowa being desirous to avail themselves of telegraphic communication, have made application to Government to construct a branch line from Yaas to Burrowa, a distance of 35 miles. It is understood that the application has been complied with. Similar applications for opening stations at various places through which the line passes have also been made.

New Zealand Tobacco.—A most luxuriant crop of tobacco is said to have been recently growing upon some land at Epsom, in this colony, and is stated to be equal in appearance to the best grown crops in America. Unfortunately, however, there appears to be no one in the colony who understands the treatment of the leaf, or its manufacture into good merchantable tobacco.

Melbourne Botanic Gardens.—The building for the new laboratory at the Botanic Gardens has been furnished and fitted up with the necessary apparatus, and a series of experiments commenced under the direction of Mr. Muller, for the extraction of tar acids, potash, &c., from the various woods of the colony, with a view to preparing a tabular statement of their respective products, and also that specimens may be in readiness for the forthcoming exhibition. It is also intended to test various natural products of the colony, as to their suitability for paper material, and to prepare various raw materials in a fit state for export. It may be mentioned that the essential oils prepared from the leaves of the eucalypti, &c., in a similar series of experiments undertaken prior to the last exhibition have now become articles of commerce.

Pleuro-pneumonia, Tasmania.—A proclamation appears in the *Tasmanian Gazette* prohibiting the importation of all cattle in Tasmania, subject nevertheless to the following conditions:—Cattle may be imported if landed at either Hobart-town, Launceston, or Port Arthur, on the condition of undergoing an inspection by an officer appointed by the Governor prior to their being landed. Any cattle that on inspection may appear to be infected with the disease pleuro-pneumonia to be immediately killed and disposed of as the inspecting officer may direct. Imported cattle, once placed in the slaughter yards, are not to be removed therefrom until slaughtered. Cattle imported from the United Kingdom may, on undergoing a satisfactory inspection by such officer as aforesaid, be landed at any of the above places. None of the above conditions are, however, in any way to affect the landing of cattle in the islands situate in Bass's Straits.

Progress of Melbourne.—The value of the imports and exports at the port of Melbourne, up to the 17th of February of the present year, as compared with the corresponding portion of the previous year, is as follows:—Imports, 1865—£1,753,714; exports, £1,605,920. Imports, 1866—£188,156; exports, £1,649,624. There is therefore an increase in the value of the imports of £130,442, but a decrease in the value of the exports of £46,296. The value of property in Melbourne has lately much increased; a private residence and grounds within a few miles of Melbourne, which a few months ago were purchased for £3,200, have just been resold for £4,500. An hotel in Elizabeth-street was lately offered at £4,000, and £5,500 has recently been refused. At the present time three of the best private residences ever erected in Victoria are in process of building in one of the suburbs, their cost being estimated at about £12,000 each.

Notes.

Paris Telegraphic Service.—The system of urban telegraphs in Paris is being gradually carried towards perfection, and the rapid increase in the use of the wires by the public, shows how much these improvements are appreciated. In the first place messages can now be sent from one station to another without passing through the central office as heretofore; under the present arrangement the average time for the delivery of a message by the telegraph is reduced to twenty minutes; the word Paris has been suppressed from the direction; and lastly, the messengers who deliver the telegrams are authorised to receive the messages in reply and to collect the charges, so that a person receiving a telegram may answer it on the instant without quitting his house.

Post-office Savings Banks.—The annual return of the Post-office Savings Banks has been issued. The amount due for principal and interest to depositors, which was £4,993,123 at the close of the year 1864, had risen to £6,526,400 at the close of 1865—an increase in the year 1865 of no less than £1,533,277, or above thirty per cent. The amount of business done in the year was

very great; as much as £3,719,017 was received, and £2,318,610 paid out. The charges and expenses for the year amounted to £49,526. At the end of the year the sum standing to the credit of the Post-office Savings Bank fund at the National Debt Office, with the balance in the hands of the Postmaster-General, amounted to £6,586,657, to meet the liability of £6,526,400.

A Worm Protector, designed to capture and kill the worms which annually infest the trees of forests and parks and fruit trees, has been invented by F. R. House, of Connecticut. It consists of a tin screen, of bell shape, which is to be soldered around the tree and suspended on an india-rubber band that fits the bark closely; under the expanded edge of the screen, and concealed, there is a receptacle for oil; the worms in their ascent cannot pass the "protector," but are likely to fall into the oil. This invention has been tested, it is said, with the best results.

The Post Office and the Telegraph.—The time appears to be approaching (says Messrs. Travers) when the Post-office should take the telegraphic system of the country into its hands. The great benefit of communication by telegraph is almost neutralised by the heavy charge made by the companies, and by the fact of the offices being only open for a limited time. It is not extravagant to say, that were the telegraphs of the country organised on a uniform system, messages of fifteen words could be profitably sent to any part of the kingdom for 6d. Switzerland is a poor and thinly-peopled country, yet messages of (we believe) twenty words can be sent, within any part of her boundaries, for 1 franc, or 9½d.; and the operation is a profitable one to the Government. When will rich and densely-peopled England be able to say the same?

Eruption Produced by an Artesian Well.—A correspondent at Venice of the *Independance Belge* states that an artesian well was being dug in a garden, near the Church of St. Agnes at Venice, and had reached to a depth of fifty metres, when, in the afternoon of the 11th of April last, when the workmen had left off work, a subterranean rumbling was heard, and a jet of water, the diameter of the opening, and the height of a house, was thrown from the mouth of the well. After some time the noise increased, and solid smoking masses were thrown up with the water, falling upon the houses near. It is even stated that the violence of the eruption was so great that a considerable crack was made in the wall of the church, and the inhabitants of many of the neighbouring houses were compelled to leave them. After a time a large number of workmen were brought to the spot, and openings were made to allow the water to escape; this, according to the correspondent who sends the account, prevented any further mischief. The eruption appears to have continued till half-past eleven at night.

Correspondence.

Granite Working.—Sir,—In my remarks on Mr. Muir's paper, reported in the last *Journal* (p. 473), what I intended to convey was that—"It had been found that the small ornamental polished columns of Salisbury Cathedral had been subject to scaling, which was attributed, by a writer of the last century, to the high degree to which they were polished, but this opinion was opposed by more recent writers on the subject." Referring since to a "Hand-book of Salisbury Cathedral," published by Blake, 1856, at page 9 I find the following:—"The pillars and shafts, both for use and ornament, are of Purbeck marble, but with this difference—the pillars which bear the weight lie in their natural form as found in the quarry; the shafts for ornament have their form inverted, which would make them subject to split or cleave asunder were they to support any weight at all."—I am, &c., W. Botley.

Salisbury-villa, Upper Norwood.

MEETINGS FOR THE ENSUING WEEK.

Mon......Entomological, 7.
British Architects, 8.
Asiatic, 3. Annual Meeting.
Odontological, 8.
Royal Inst., 2. General Monthly Meeting.
R. United Service Inst., 8½. Captain A. Moncreiff, "Moncreiff's method of mounting Guns with counter weights, of using them in gun-pits, and of laying them with reflecting sights."

Tues. ...Anthropological, 8.
Geologists' Assoc., 8.
Royal Inst., 3. Prof. Ansted, "On the Application of Physical Geography and Geology to the Fine Arts."

Wed. ...Geological, 8. 1. Prof. R. Harkness, "On the Metamorphic and Fossiliferous Rocks of County Galway." 2. Mr. J. Geikie, "On the Metamorphic lower Silurian Rocks of Carrick, Ayrshire." Communicated by Prof. A. C. Ramsay. 3. Prof. W. C. Williamson, "On a Cheirotherian Footprint from the base of the Keuper." Communicated by the Assistant-Secretary. 4. Mr. J. W. Pike, "On some remarkable Heaves or Throws in Penhall Mine." Communicated by Dr. C. Le Neve Foster.
R. Society of Literature, 8½.

Thur....Antiquaries, 8½.
Chemical, 8. Mr. A. Vernon Harcourt, "On the course of Chemical Action."
Linnæan, 8. 1. Mr. John Miers, "On *Myostoma*, a new genus of *Burmanniaceæ*." 2. Dr. George Sigerson, "On Cortical Cunea e Rays, and their origin." 3. Dr. W. L. Lindsay, "On New Zealand Lichens." 4. Major S. R. T. Owen, "On the Surface-Fauna of mid-ocean in *Foraminifera*."
Royal Society Club, 6.
Royal Inst., 3. Prof. Huxley, "On Ethnology."

Fri ......Astronomical, 8.
Royal Inst., 8. Prof. Frankland, "On the Source of Muscular Power."

Sat ......R. Botanic, 3¾.
Royal Inst., 3. Prof. Huxley, "On Ethnology."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 16th May, 1866.*

159. Bill—Belfast Constabulary.
137. Works and Public Buildings—Abstract Accounts.
222. Customs—Minute.
225. Coals, Cinders, and Culm, &c.—Account.
250. Parliamentary Representation (Ireland)—Returns.
Church Estates Commission—Fifteenth Report and Appendix.

Delivered on 17th May, 1866.

147. Bill—Sea Coast Fisheries (Ireland).
47. Navy (Crime and Punishment—Report.
201. Maidstone Election Petition (corrected pages).
244. Deviation of Compasses—Return.
247. Bridgwater Election—Minutes of Evidence.
265. Railway Reform (Ireland)—Memorial.

Session 1865.

442. (c). Poor Rates and Pauperism—Return (C.) (In-Maintenance and Out-Door Relief).

Delivered on 18th May, 1866.

246. Post-office Savings Banks—Account.
248. Prisoners (House of Correction, Tothill-fields, &c.)—Returns.
262. Chinese Pirates—Return.
263. Portpatrick Harbour—Correspondence.
268. Population, Revenue, &c.—Returns.
270. London (City) Corporation Gas, &c., Bills—Report from Select Committee.

Session 1865.

442. (a. xi.) Poor Rates and Pauperism—Return (A) (March, 1865 and 1866).

Delivered on 19th May, 1866.

161. Bills—Elections (Returning Officers).
164. „ Nuisances Removal.
64. (i.) Sheriff Courts (Scotland)—Returns.
249. Fisheries (Ireland) Act—Return.
256. Grand Jury (Ireland) Act—Return.
258. Tea, Coffee, &c.—Return.

Delivered on 22nd May, 1866.

160. Election Expenses—Returns (Part I. Counties, England and Wales).
283. Terminable Annuities—Statement.

Delivered on 23rd May, 1866.

151. Bills—Railway Companies Securities.
160. „ Colonial Bishops.
162. „ Reformatory Schools.
163. „ Industrial Schools.
63. (vi.) Committee of Selection—Seventh Report.
69. (iii.) Railway and Canal Bills—Fourth Report.
238. Poor Removal (Ireland)—Correspondence.

271. Probate Duty, &c.—Return.
Cattle Plague—Third Report of Commissioners and Appendix.

Delivered on 24th May, 1866.

160. (I.) Election Expenses—Return (Part II., Cities and Boroughs).
251. East India (Military Finance, &c.)—Return.
254. Exchequer—Account.
255. Hereford City Election—Minutes of Evidence, &c.
267. Navy (Ship *Trusty*)—Return.
277. Boroughs (England and Wales)—Return.
281. Union of Benefices (London)—Draft of Scheme.
282. Cattle Diseases (Ireland) Act—Orders in Council.

Delivered on 25th May, 1866.

253. Cunard Mail Steamers—Return.
264. Mercantile Marine Fund—Account.
Post-office—Twelfth Report of the Postmaster-General.

Delivered on 26th May, 1866.

160. (II.) Election Expenses—Return (Part III., Cities and Boroughs) continued.
284. Freeholders—Return.
285. Railways—Report.

Delivered on 28th May, 1866.

83. (I.) Customs' Clerks (London)—Treasury Minute.
266. Customs' Clerks (Out Ports)—Correspondence.
280. Salmon Fisheries (England and Wales)—Fifth Annual Report.
Bank of England—Letter from the Governor.

Delivered on 29th May, 1866.

146. Bill—Indian Prize Money.
151. Civil Services—Statement of Excesses (corrected copy).
176. Sanitary Works—Return.
Public General Acts—Caps. 21 to 31.

Patents.

From Commissioners of Patents' Journal, May 25th.

GRANTS OF PROVISIONAL PROTECTION.

Air, exhausting and compressing—1282—G. Davies.
Ammoniacal and ammoniated soap—130—J. Hooker.
Animal and vegetable charcoal, calcining, &c.—1242—W. Cormack.
Animals, destroying vermin on—1274—J. G. Hope.
Artificial flowers—1244—A. A. Costallat.
Baling bands, fastenings for—1208—E. J. Beard.
Bars of metal, cutting—1325—J. Fletcher.
Bottles, corking—1357—H. Fraser.
Carding engines, double-cylinder—1343—L. R. Bodmer.
Carriages—1345—W. Botwood.
Caustic alkalies, obtaining—922—J. Davis.
Central fire guns, working the extractors for—1300—W. W. Cross.
Centrifugal governors—1379—G. Haseltine.
Clarifying apparatus—1310—W. E. Gedge.
Coal, distilling—1278—W. Young and P. Brash.
Cooking ranges—1306—B. Wright.
Cop tubes—1264—H. and J. Douglas.
Cricket wickets—1246—W. H. Stanley.
Crinoline skirts—1168—H. A. Bonneville.
Cupola and other furnaces—1292—S. Chatwood and J. Sturgeon.
Engines, valves for—1304—M. H. Atkinson.
Explosive compounds—1341—J. H. A. Bleckmann.
Feeding holders—1236—F. F. Benvenuti.
Fibres, combing—1283—C. E. Brooman.
Fibres, dressing—1298—D. Chadwick, jun., and G. A. C. Bremme.
Fibrous materials, preparing—1359—E. Brasier.
Fibrous materials, washing—577—J. Petrie, jun.
Fibrous substances, preparing, &c.—1353—W. C. Moore, J. M. Haslam, and J. Robinson.
Fire-arms, breech-loading—1361—T. Hunt.
Fire-arms, breech-loading—1367—C. Pryse and R. Redman.
Fire-places—1395—W. Clark.
Furnaces—1173—W. Edmond and A. Gurlt.
Furnaces—1210—W. Begg.
Furnaces—1252—D. Urquhart.
Gas lamps—1188—J. Wavish.
Gas, purifying—1233—G. C. Denis.
Grain, drying and cooling—1326—J. H. Johnson.
Gun barrels, cleaning—1258—J. W. Post and W. McI. Cranston.
Hooks—1172—H. Gardner.
Insects, traps for destroying—1228—J. V. Delestre.
Iron bedsteads—1178—G. H. and H. R. Cottam.
Iron ships, preventing corrosion of—1209—W. P. Pigott.
Lace, tabby weavings in—1290—J. Hartshorn.
Land, applying sewage to—1373—G. H. Bovill.
Leather, attaching buttons, &c., to—1260—F. Field.
Materials, printing and finishing—1176—A. Paraf.
Milk, preserving—1198—G. Burnard and L. Koppel.
Minerals, cutting—1224—J. Nisbet.
Night lights 1234—J. Jackson
Pipes, discharging the contents of—1330—S. Middleton.
Plastic material, moulding—1194—T. Dixcee.
Printers' rags, treating—1383—H. Muller and W. de la Rue.
Pyrites, treating the residues of—1381—W. de la Rue and H. Muller.
Railway carriages, axle-boxes for—1312—F. Wise.
Railway carriages, axles for—1377—J. E. Phillips.
Railways, rails for—1297 J. L. Booth.
Ratchet braces and levers—1196—T. A. Weston.
Reaping machines—1096—E. Lord and R. Norfolk.
Revolving shutters—1170—T. Kirby.
Rotary engine pump and water meter—1286—A. L. Bricknell.
Rotary engines—1385—B. G. Nichol.
Rotary motion, obtaining—1209—H. B. Newton.
Safes—1387—J. S. Gisborne.
Sewing machines—1391—J. W. Bartlett.
Ships of war—472—R. Napier.
Ships, propelling and steering—1311—J. H. Johnson.
Shuttles—1268—R. Darragh.
Spinning frames, steps for the spindles of—1279—G. T. Bousfield.
Spinning machinery—1204—W. Sunderland and G. Stell.
Steam boilers—1302—T. Green.
Steam boilers—1375—T. Holt.
Steam, drying—1308—W. Ireland.
Steam engines, heating the boilers of—1240—G. Davies.
Steel and iron—1248—W. de la Rue.
Substances, preserving—1349—D. Nicoll.
Surveying instrument, a new—1202—D. R. Edgeworth.
Tapers and friction matches—1324—S. A. Bell.
Telegraph wires, insulators for—1226—G. Davies.
Textile fabrics, printing and dyeing—1174—A. Paraf.
Twist drills—1164—W. Clark.
Utensils, protecting the surfaces of—173—J. A. Nicholson.
Valves—1230—J. Lewis.
Ventilation—1182—E. Holden.
Ventilators—1190—D. B. White.
Vessels, attaching wooden planking to—1322—J. H. Ritchie, jun.
Watch pendants—1314—G. Snowball.
Waterclosets—1337—W. Hackett and W. Marsden.
Waterclosets 1363—T. J. Chapman and T. Rose.
Weaving, looms for—1222—H. Lea.
Wool, washing—1288—J. H. Johnson.
Yarns, spooling and copping—1044—W. Clark.

PATENTS SEALED.

3045. F. Mole.	3130. A. B. Brown.
3049. E. Drucker.	3156. O. Maggs and G. H. S...
3057. T. Laurie.	3185. R. F. Fairlie.
3060. J. Stokes and T. Gray.	3199. W. R. Lake.
3062. T. Lancaster.	3209. H. K. York.
3067. C. S. Baker.	3238. W. Pretty.
3068. R. Howarth.	3382. W. E. Newton.
3070. J. T. Hall.	102. W. J. Walsh.
3077. J. L. Norton and J. Landless.	110. J. C. Thompson.
3081. J. Wilson.	150. J. Stephens.
3082. W. Pringle.	187. J. McClenahan.
3089. W. Johnston.	301. C. Delafield.
3104. A. Mackie.	391. J. Roe.
3120. S. W. Wilkinson.	473. H. E. Newton.
3121. J. Prest, H. Harrison, and B. Roeber.	480. D. Nicoll.
	688. W. Richards.

From Commissioners of Patents' Journal, May 29th.

PATENTS SEALED.

3084. T. W. Dodds.	3133. E. Whele.
3086. H. Hedley and G. Ainsley.	3213. J. Stocker.
3087. W. R. Taylor.	3274. J. T. Dawes and J. ...
3091. E. Scott.	3326. R. M. Marygold & S. F...
3092. A. J. Wright.	602. M. & M. Myers, & W. ...
3094. R. Edmonson.	766. S. S. Merriam.
3097. B. Cook.	846. C. D. Abel.
3113. E. C. Hodges.	868. J. Erskine.
3123. I. Holden.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1272. W. Nunn.	1341. C. F. Baxter.
1309. H. A. Bonneville.	1343. F. Osbourn.
1292. J. Sturgeon.	1362. W. Clark.
1300. F. Potts and J. Key.	1405. W. Clark.
1331. H. C. Coulthard.	1449. W. Clark.
1338. G. Gore.	1310. P. Leprovost.
1342. T. Richardson and R. Irvine.	1321. A. Haley.
1320. W. Clark.	1334. W. Palliser.
1322. J. Munro and R. Scott.	1350. W. Loader.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1311. W. Weild.	1318. T. Wilson.
1316. G. Hadfield.	1325. A. Smith.

Registered Designs.

Music Stool, Canterbury Whatnot or Stand for Music—April ... 4789—E. Llewellyn, 23, Bolsover-street, Portland-place, W.
A New Game, to be called Crescente—May 3—4790—T. ... Watford, Herts.
Angular Corrugated Ridge and Furrow Roofing Tile—May ... —H. I. and C. Major, Bridgewater, Somersetshire.
Croquet Mallet—May 11—4792—Parkins and Gotto, Oxford-... W.
An Improved Fastening for Umbrellas and Parasols—May ... —W. Matthews, 56, Basinghall-street, City.

Journal of the Society of Arts.

FRIDAY, JUNE 8, 1866.

Announcements by the Council.

Conversazione.

The Council have arranged for a Conversazione on Wednesday evening, the 13th June, at the South Kensington Museum, cards for which have been issued.

Any member who has not received his card of invitation should communicate with the Secretary without delay.

Fifteenth Annual Conference.

The Fifteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards will be held on Wednesday, the 13th June, at Twelve o'clock, noon. William Hawes, Esq., Chairman of the Council, will preside.

Secretaries of Institutions and Local Boards are requested to send immediately the names of the Representatives appointed to attend the Conference, and a copy of the last Report of each Institution should be forwarded, by book post, without delay.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the Results of the Examinations, as well as the Programme of Examinations for 1867.

The following suggestions of Subjects for discussion have been received from various quarters, it being understood that in putting them forward the Council express no opinion whatever upon them :—

1. The scheme of Elementary Examinations :—whether the Society of Arts should continue to furnish elementary papers to Unions and Local Boards, or whether it would be better for the Society to confine its attention exclusively to the Final Examinations?
2. Presuming the outline of the present scheme to be retained, whether any modifications in the details should be made, such, for instance, as

(a.) To substitute the terms First and Second Divisions for "Higher and Lower Grades," and to award first, second and third class Certificates to successful Candidates.

(b.) So to arrange the time-table that the Examinations shall not clash with those of the Science and Art Department.

(c.) That English Grammar be added to the list of optional subjects.

3. What means can be adopted to secure a greater number of Female Candidates at the Elementary Examinations?
4. Whether the great City Companies and other analogous bodies might not be invited to co-operate with the Society in promoting the Education of Adults by special prizes for competition in subjects with which such companies are officially concerned, or among Candidates connected therewith?
5. Whether the co-operation which already exists between this Society and the Royal Horticultural Society for the promotion of Education among Gardeners, might not be extended to other societies, with a view to the better promotion of Education among other classes of working men?
6. Whether cheaper Text books could not be in some cases recommended to Candidates at the Final Examinations, or whether any means could be adopted for enabling them to have ready access to the more expensive ones?
7. Whether it would be desirable for the Council to endeavour to interest the clergy, gentry, and others in country districts, in the Society's scheme of Examinations, by issuing an explanatory address, and directing attention to the existence of Local Educational Boards?
8. How far employers in London and other large towns can be induced to aid the Educational scheme, by giving to young men in their employ special encouragement to join the Institution Classes?
9. How can Institutions promote competition for the Prizes offered by the Society of Arts in Art-Workmanship?
10. The possibility of establishing Museums of a simple character, to circulate throughout the country, in connection with Institutions and Evening Schools, on the plan adopted by the Science and Art Department for Schools of Art.
11. By what means can the Society of Arts promote the erection of suitable buildings for the use of Literary and Mechanics' Institutes?
12. In what way can the Society of Arts aid Institutions in securing the services of gentlemen qualified to give popular Lectures on Scientific Subjects?
13. Can a Literary Institute be so conducted as to provide rational amusement and the means of mental improvement for the *various* classes of society? And, if so, what appliances are necessary for the successful working of such an Institute?
14. The promotion of athletic exercises, especially in the metropolis and other large towns, by establishing Gymnasia or otherwise.

Notice of any other subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference should be sent to the Secretary of the Society of Arts.

Representatives of Institutions and Local Boards attending the Conference are invited to the Society's Conversazione, at the South Kensington Museum, on the evening of the same day (13th June), and will receive cards on application at the Society's House, on the day of the Conference.

FINAL EXAMINATION, 1866.

PRIZES AND CERTIFICATES AWARDED TO CANDIDATES.

PRIZES.

His Royal Highness the Prince Consort's Prize of Twenty-five Guineas to

733—James Rigby Smith, aged 25, of the City of London College, clerk, who has obtained the following First-class Certificates :—

1863. Political Economy—First-class Certificate.
„ Arithmetic—First-class Certificate.
„ Geometry—First-class Certificate.
1864. Book-keeping—First-class Certificate.
1865. Algebra—First-class Certificate, with Second Prize.
„ Logic and Mental Science—First-class Certificate.
1866. Domestic Economy—First-class Certificate.

Arithmetic ..	1st Prize........	£5	To No. 760—George Armytage Smith, 22, Royal Polytechnic Local Board, clerk
	2nd Prize	3	„ 1164—William Henry Stanier, 16, Wolverhampton Athenæum, railway clerk
Book-keeping	1st Prize........	5	„ 760—George Armytage Smith, 22, Royal Polytechnic Local Board, clerk
	2nd Prize	3	„ 669—Herbert Burgess Brain, 25, City of London College, clerk
Algebra	1st Prize........	5	„ 961—Thomas Edwards, 17, Pembroke Dock Mechanics' Institute, shipwright (apprentice)
	2nd Prize	3	„ 760—George Armytage Smith, 22, Royal Polytechnic Local Board, clerk
Geometry ..	1st Prize........	5	„ 767—William Pethybridge, 20, Royal Polytechnic Local Board, clerk
	2nd Prize	3	„ 760—George Armytage Smith, 22, Royal Polytechnic Local Board, clerk
Mensuration..	1st Prize........	5	„ 1006—John Thomas Wright, 21, Werneth Mechanics' Institution, book-keeper
	2nd Prize	3	„ 1099—William Ludgate Massy, 20, Southampton Athenæum, clerk in H.M. Customs
Trigonometry	1st Prize........	5	„ 342—Thomas Henry Goodyear, 19, Devonport Mechanics' Institute, engineer (student) *No Second Prize awarded* *
Conic Sections..................		..	*No Prizes awarded* †
Navigation & Nautical Astronomy ..	1st Prize........	5	„ 718—William Meadows, 18, City of London College, clerk *No Second Prize awarded* *
Principles of Mechanics..	1st Prize........	5	„ 718—William Meadows, 18, City of London College, clerk *No Second Prize awarded* *
Practical Mechanics	1st Prize........	5	„ 635—Walter J. Robinson, 28, Leeds Young Men's Christian Association, mechanic *No Second Prize awarded* *
Electricity & Magnetism..	....	..	*No Prizes awarded* †
Light & Heat..................		..	*No Prizes awarded* †
Chemistry ..	1st Prize........	5	„ *205—James Willington Clifft, 21, Bristol Trade and Mining School, perfumer
	2nd Prize	3	„ 785—Alfred Richard Hall, 18, Greville House Institute, chemist
Mining and Metallurgy..	....	..	*No Prizes awarded* †
Botany	R. Horticultural Society's Prizes of £5, £3, and £1 each	5	„ 789—John Duncan, 22, London Mechanics' Institution, gardener
		3	„ 1012—George Marshall Woodrow, 20, Richmond Parochial Library, gardener
		1	„ 455—Robert Crease Kingston, jun., 19, Hull Christian and Literary Institute, gardener *The Society's Prizes were not awarded, as no candidate obtained a First-class Certificate.*
Floriculture..	1st Prize........	5	„ 1082—George Stanton, 25, Slough Mechanics' Institute, gardener
	2nd Prize	3	„ 1012—George Marshall Woodrow, 20, Richmond Parochial Library, gardener *The Prizes offered by the Proprietors of the "Gardeners' Chronicle" in this subject were not awarded, as none of the Candidates obtained also a Second-class Certificate in either Book-keeping or Mensuration.*

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified from receiving Prizes.
† No First-class Certificates were awarded in any of these subjects.

Fruit & Vegetable Culture	1st Prize........	£5	To No. 604—William Prichard Roberts, 26, Ipswich Working Men's College, gardener
	2nd Prize	3	„ 1012—George Marshall Woodrow, 20, Richmond Parochial Library, gardener
			The Prizes offered by the Proprietors of the "Gardener's Chronicle" in this subject were not awarded, as none of the candidates obtained also a Second-class Certificate in either Book-keeping or Mensuration.
Animal Physiology (in relation to Health)....	1st Prize........	5	„ 704—John Hughes, 22, City of London College, assistant in a laboratory
	2nd Prize	3	„ 242—Robert Walton, 22, Burnley Church of England Institute, weaver
			The other candidates who obtained First-class Certificates in this subject are disqualified for receiving Prizes.
Domestic Economy......	1st Prize........	5	„ 357—Henry George White, 24, Devonport Mechanics' Institute, shipwright
	2nd Prize	3	„ 242—Robert Walton, 22, Burnley Church of England Institute, weaver
Political & Social Economy	1st Prize........	5	„ 479—James Wade, 29, Glasgow Athenæum, cashier
			No Second Prize awarded *
Geography ..	1st Prize........	5	„ 729—Thomas Rigg, 20, City of London College, clerk
	2nd Prize	3	„ 623—Charles Burdett Ogden, 16, Leeds Mechanics' Institute.
English History	1st Prize........	5	„ 792—Eugene Vernon Barrett, 21, London Mechanics' Inst., clerk
	2nd Prize	3	„ 729—Thomas Rigg, 20, City of London College, clerk
English Literature	1st Prize........	5	„ 707—Frederick Noel Jewesbury, 18, City of London College, clerk
	2nd Prize	3	„ 709—John Kennedy, 21, City of London College, clerk in H.M. Customs
Logic & Mental Science..	1st Prize........	5	„ 738—William Vaughan, 25, City of London College, clerk
	2nd Prize	3	„ 479—James Wade, 29, Glasgow Athenæum, cashier
Latin and Roman History	1st Prize........	5	„ 41—David Fitzgerald, 24, Guildford Institute, clerk and draughtsman
			No Second Prize awarded *
French	1st Prize........	5	„ 485—John Pagan, 24, Glasgow Athenæum, book-keeper
	2nd Prize	3	„ 735—Charles Dansey Symonds, 18, City of London College, clerk
German	1st Prize........	5	„ 700—William Holman, 23, City of London College, clerk
	2nd Prize	3	„ 690—James Henry Goodyear, 18, City of London College, clerk
Italian......	1st Prize........	5	„ 676—James Clayton, 32, City of London College, sorter, General Post-office
			No Second Prize awarded *
Spanish	1st Prize........	5	„ 687—James Charles Genge, 17, City of London College, clerk
	2nd Prize	3	„ 670—George W. F. Brock, jun., 18, City of London College, clerk
Free Hand Drawing ..	1st Prize........	5	„ 343—Herbert Keate Gribble, 19, Devonport Mechanics' Institute, architect's pupil
	2nd Prize	3	„ 1091—Rowland McFadden, 20, Southampton Athenæum, engraver (ordnance survey)
Geometrical Drawing ..	1st Prize........	5	„ 265—Charles J. Fairlie, 26, Burrage-road Evening Classes, draughtsman
	2nd Prize	3	„ 1077—Henry B. Dorrell, 19, Slough Mechanics' Institute, carpenter and joiner
Theory of Music	1st Prize........	5	„ 396—Thomas Cain, 30, Halifax Mechanics' Institute, cardmaker
	2nd Prize	3	„ 349—Robert Smith, 18, Devonport Mechanics' Institute, photographer's assistant

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified for receiving Prizes.

CERTIFICATES.

The following is an Alphabetical List of the Candidates who have obtained Certificates:—

The numbers following the names give the ages of the Candidates.

(1st) after a subject signifies a First-class Certificate.
(2d) „ „ Second-class „
(3d) „ „ Third-class „

(The occupations stated are either present or proposed.)

665—Abell, Edward G., 17, City of London Coll., clerk—French (3d)

569—Adam, John 20, Glasgow M.I., mason—Alg. (3d)

206—Adcock, Edmund, 20, Brighton, teacher—Arith. (1st); Geog. (1st); Bkpg. (3d); Alg. (3d)

426—Akroyd, Joseph, 18, Halifax W.M. Coll., wire-drawer—Arith. (3d); Bkpg. (3d)

78—Alderson, Emily, 28, Birm. and Midl. Inst., daily governess—French (2d)

79—Alderson, Louisa, 30, Birm. and Midl. Inst., governess—Eng. Lit. (2d)

476—Alexander, James, 19, Glasgow Ath., clerk—Bkpg. (1st)

922—Alexander, William M., 26, Paisley Artizans' Inst., architect: surveyor's assist.—German (1st)

515—Anderson, James, 29, Glasgow M.I., clerk—Mens. (1st)

567—Anderson, John C., 19, Glasgow M.I., book-keeper—Bkpg. (1st)

80—Anderton, John G., 22, Birm. and Midl. Inst., optician—Light and Heat (2d)

897—Appleby, William, 19, Manchester M.I., clerk—Bkpg. (2d)

290—Armstrong, John, 16, Carlisle M.I., clerk—Arith. (2d); Eng. Hist. (2d); Geom. (2d)

957—Arthur, John, 24, Paisley Artizans' Inst., pattern drawer—Music (3d)

232—Ascough, William, 17, Burnley Church of Eng. Lit. Inst., pupil teacher—Anim. Phys. (2d)

46—Ashby, John T., 19, Farnham Y. Men's Inst., teacher—Arith. (1st); Geog. (2d)
81—Atkins, Alfred H., 19, Birm. and Midl. Inst., teacher—Chem. (1st); Geom. (1st); Alg. (2d)
315—Atkinson, John A., 23, Crewe M.I., post messenger —Geom. Dwg. (2d); Mens. (3d)

373—Baguley, Mathew, 19, Droylsden Educ. Inst., warehouseman—Chem. (2d); Geog. (2d); Geom. Dwg. (3d)
1114—Bailey, David, 31, Bilston Inst., schoolmaster—Arith. (1st); Eng. Lit. (2d)
333—Bailey, George, 24, Devonport M.I., shipwright —Eng. Hist. (2d)
804—Ballard, Elizabeth R., 24, Lond. M.I.—Dom. Econ. (3d)
481—Barclay, John, 18, Glasgow Ath., clerk—Eng. Lit. (3d)
968—Barker, Miles, 23, Swinton M.I., colliery clerk—Arith. (1st); Mensur. (1st); Alg. (2d)
131—Barlow, James, 22, Bolton M.I., com. traveller—Eng. Lit. (3d)
758—Barnard, Blanche, 18, Roy. Polyt. Inst., artist—French (3d)
667—Barnes, William H., 25, City of Lond. Coll.—Bkpg (1st)
1183—Barnett, Thomas, 20, Stockport M.I., clerk—Arith. (2d)
792—Barrett, Eugene V., 21, Lond M.I., clerk—Eng. Hist. (1st) with 1st prize; Geog. (1st); Arith. (3d)
610—Barron, Thomas H., 20, Leeds M.I., book-keeper —Arith. (1st); Bkpg. (2d)
83—Barwell, Sarah M., 17, Birm. and Midl. Inst., French (3d)
845—Bateman, Thomas, 21, Manchester M.I., clerk—Arith. (3d)
402—Bates, John D., 19, Halifax M.I., wool-sorter—Bkpg. (3d)
1129—Batham, David, 18, Woodside and Hartshill Inst., clerk—Arith. (3d); Bkpg. (3d)
254—Battersby, John, 22, Burrage-road Evg. Classes, turner—Geom. Dwg. (2d)
388—Baxendale, John W., 19, Halifax M.I., warehouseman—Bkpg. (3d)
218—Bayne, Thomas, 16, Burnley M.I., shop-boy—Bkpg. (2d)
49—Beagley, Charles, 17, Alton M.I., pupil-teacher —Eng. Hist. (2d); Geog. (2d); Arith. (3d)
5—Beattie, William, 25, Aberdeen M.I., clerk—French (2d)
1107—Beer, Henry, 16, Southampton Ath., clerk—Bkpg. (2d); Arith. (3d)
1101—Beer, Thomas, 26, Southampton Ath., clerk—Music (2d)
761—Belfrage, David M'C., 31, Roy. Polyt. Inst., clerk —Bkpg. (3d)
1224—Bell, George, 19, York Inst., bricklayer—Geom. Dwg. (3d); Free-hd. Dwg. (3d)
453—Bell, William, H., 17, Hull Young People's Inst., clerk—Arith. (3d)
1131—Bennett, James, 28, Kinver Young Men's Inst., carpenter—Geom. Dwg. (3d); Princ. Mech. (3d)
1130—Bennett, John, 24, Kinver Young Men's Inst., Registrar of Births, and Deaths—Chem. (2d); Arith. (3d); Lat. and Roman Hist. (3d)
1070—Bentley, Joseph E., 21, Salford W.M. Coll., clerk—Bkpg. (2d)
1261—Best, John J., 20, Newcastle-on-Tyne Ch. Inst., accountant's clerk—Music (1st)
795—Bickle, John, 24, Lond. M.I., smith—Eng. Hist. (2d)
448—Biddles, Frederick J., 20, Hull Young People's Inst., merchant's clerk—Arith. (2d); Bkpg. (2d)
68—Biggar, William, jun., 22, S.E. Rwy. M.I., engine-fitter—Arith. (3d)
*1239—Bird, Joseph, 20, Stourbridge Ch. of Eng. Inst., warehouse clerk—Arith. (2d)
412—Birkbeck, Sam., 24, Halifax W.M. Coll., clerk—Eng. Lit. (3d)
590—Blair, James, 18, Pop. Evg. Classes, And. Univ., Glasgow, clerk—Bkpg. (2d)
600—Blasby, Frederick Jas., 20, Ipswich W.M. Coll., clerk—Arith. (1st); Bkpg. (3d)
987—Boardman, Thomas, 28, Oldham Lyceum Sch. of Sci. and Art, self-actor minder—Geom. Dwg. (3d)
334—Bond, Samuel J., 16, Devonport M.I., engineer (student)—Arith. (1st)
1167—Booth, Henry C., 22, St. Peter's (Wolverhampton), Evg. School, teacher—Geog. (2d); Eng. Hist. (3d)
458—Booth, Isaac, 30, Hyde M.I., book-keeper—Arith. (3d)
483—Borland, Andrew, 24, Glasgow Ath., book-keeper—Eng. Lit. (1st)
1195—Bottoms, Walker, 24, Wilsden M.I., power-loom weaver—Arith. (3d); Bkpg. (3d); Geog. (3d)
640—Bowmar, Alfred W., 16, Leicester Ch. of Eng. Inst., banker's clerk—Bkpg. (2d)
461—Bradbury, Edwin, 30, Freetown (Glossop) W.M. Inst., clerk—Bkpg. (1st)
1022—Bradshaw, George, 17, Salford W.M. Coll., pupil teacher—Mensura. (2d)
669—Brain, Herbert B., 25, City of Lond. Coll., clerk—Arith. (1st); Bkgp. (1st) with 2d prize
427—Brearley, Thomas, 19, Halifax W.M. Coll., pupil teacher—Eng. Lit. (1st); Arith. (3d)
424—Brearley, William H., 20, Halifax W.M. Coll., clerk—Arith. (1st); Eng. Lit. (2d)
*1240—Breese, Charles, 17, Stourbridge Ch. of Eng. Inst., glass engraver—Freehand Dwg. (2d)
806—Brend, Jonathan, 46, St. Stephen's (Westm.) Evg. School, clerk—Arith. (3d)
1255—Brereton, Richard, 24, Banbridge Lit. Inst., clerk —Arith. (1st); Eng. Hist. (3d); Geog. (3d)
240—Bridge, Thomas, 18, Bromley Ch. of Eng. Lit. Inst., solicitor's clerk—Arith (3d); Bkpg. (3d); Anim. Phys. (3d)
323—Briggs, William, 21, Derby Wkg. Men's Assoc., iron moulder—Arith. (2d); Alg. (3d)
639—Briggs, William, 21, Leeds Y. Men's Chr. Assoc., teacher—Eng. Hist. (2d); Arith. (3d); Eng. Lit. (3d); Mensur. (3d)
1018—Britton, William H., 19, Salford W.M. Col., maker-up—Bkpg. (1st); Arith. (3d)
507—Brock, David, 20, Glasgow Inst., clerk—Geog. (2d)
670—Brock, George W. F. jun., 18, City of London Coll., clerk—Spanish (1st) with 2d prize
757—Brooks, Marion A., 28, Roy. Polyt. Inst., daily governess—French (3d)
190—Brown, George, 16, Bristol Trade School, engineer —Geom. Dwg. (2d)
928—Brown, Hugh, 17, Paisley Artizans' Inst., clerk—Arith. (2d)
595—Brown, John, 25, Pop. Ev. Classes, And. Un., Glasgow, building surveyor's assistant—Anim. Phys. (2d)
1020—Brown, Robert, 25, Salford W.M. Coll., book-keeper—Anim. Phys. (2d); Bot. (3d)
1241—Brown, T., 18, Worcester Catholic Inst., tailor—Arith. (3d); Eng. Lit. (3d)
581—Brown, William, 18, Pop. Ev. Classes, And. Un., Glasgow, teacher—Anim. Phys. (3d)
586—Browne, Andrew, 24, Pop. Ev. Classes, And. Un., Glasgow, warehouseman—Animal Physiology (3d)
1150—Brownhill, William, 22, Walsall Church Inst., ironmaster's clerk—Arith (1st)
224—Broxup, James, 24, Burnley M.I. mechanic—Bkpg. (3d)
923—Buchanan, David, 19, Paisley Artisan's Inst., clerk—Bkpg. (2d)

546—Buchanan, Peter, 22, Glasgow M.I., clerk, Free-hand Dwg. (2d)
551—Bulloch, John, 23, Glasgow M.I., clerk—Eng. Hist. (3d); Geog. (3d)
84—Bulpitt, William T., 24, Birm. and Midl. Inst., schoolmaster—Arith. (1st); Geog. (1st); Chem. (2d); Eng. Lit. (2d)
1267—Bulstrode, Charlotte, 16, Lambeth Evg. Classes, governess pupil—French (3d)
65—Burchall, William J., 16, Ashton-under-Lyne M.I., pupil teacher—Geom. Dwg. (2d)
751—Burgess, Edward J., 34, Roy. Polyt. Inst., boot-maker—Min. and Met. (2d); Chem. (2d)
671—Burke, Charles. 16, City of Lond. Coll., clerk—French (3d)
335—Burner, William H., 18, Devonport M.I., engineer student—Arith (1st)
336—Burt, Henry, 18, Devonport M.I., engineer student—Alg. (2d); Mens. (3d)
1217*—Busbridge, Walter, 26, Woolwich R. Arsenal, science teacher—Geom. Dwg. (1st)

891—Cadley, George, 23, Manch. M.I., boot-closer—Mens. (2d)
900—Cadness, Frederick C., 23, Manch. M.I., carrier's clerk—Bkpg. (1st)
396—Cain, Thomas, 30, Halifax M.I., card maker—Music (1st), with 1st prize.
631—Caldwell, Joseph, 19, Leeds M.I., bank clerk—Arith. (3d); Chem. (3d)
337—Canter, George C., 19, Devonport M.I., ship-wright apprentice—Mens. (1st); Conic Sect. (2d); Alg. (2d)
927—Carmichael, Charles, 19, Paisley Artizan's Inst., clerk—Arith. (2d)
877—Carter, William, 17, Manch. M.I., draughtsman (apprentice)—Geom. Dwg. (2d)
672—Carter, William D. C., 20, City of Lond. Coll., clerk—Bkpg. (2d)
1223—Cartman, Ward, 19, York Institute, joiner and cabinet maker—Free-hand Dwg. (3d)
1121—Cartwright, John, 17, Woodside and Hart's Hill Inst., pupil teacher—Arith. (3d); Bkpg. (3d)
331—Cay, George, 28, Derby M.I., traveller—Eng. Hist. (2d)
673—Champion, William, 21, City of Lond Coll., clerk—Bkpg. (2d)
1241*—Chance, Henry, F., 17, Stourbridge Ch. of Eng. Inst., in the glass trade—Free-hand Dwg. (2d)
917—Charlesworth, Seth, 17, Mossley M.I., pupil teacher—Bkpg. (2d)
264—Chasteauneuf, Léon Charles, 21, Burrage-road Evg. Classes, fitter—Geom. Dwg. (3)
674—Child, William, 20, City of Lond. Coll., apprentice—Bkpg. (2d)
1005—Chisholm, James, 19, Oldham Lyceum, bank clerk—Bkpg. (2d); Arith. (3d)
959—Christie, Thomas, 24, Paisley Artiz. Inst., shawl-cutter—Music (3d)
44—Chuter, Charles, 20, Farnham Y. Men's Inst., grocer—Bkpg. (3d)
13—Clark, Alexander, 21, Aberdeen M.I., civil engineer—Arith. (1st)
675—Clark, James, 16, City of Lond. Coll., clerk—Arith. (1st); Bkpg. (2d)
338—Clark, Robert G., 27, Devonport M.I., ship-wright—Bkpg. (2d); Alg. (3d)
806—Clark, Samuel H., 22, Lond. M.I., joiner and carpenter—Geog. (2d)
1120—Clayton, Edwin, 17, Messrs. Bagnall's Inst., Gold's Hill, pupil teacher—Latin and Rom. Hist. (1st); Arith. (2d); Eng. Hist. (3d); French (3d)
676—Clayton, James, 32, City Lond. Coll., sorter, General Post Office—Italian (1st) with 1st prize
824—Clayton, William H.. 21, Christ Church (Hulme) Inst., warehouseman—Arith. (3d)
677—Clementson, Alfred B., City of Lond. Coll., clerk—Dom. Econ. (2d)
205*—Clifft, James W., 21, Bristol Trade and Mining Sch., perfumer—Chem. (1st) with 1st prize
145—Clough, William H., 20, Bradford M.I., stationer's assistant—Bkpg. (3d); Alg. (3d); Mens. (3d)
832—Cochrane, William, 21, Manchester M.I., cabinet-maker—Eng. Hist. (2d)
1094—Cockburn, George, 17, Southampton Ath., pupil teacher—Arith. (3d); Geog. (3d)
1250—Cockell, George, 25, Chatham M.I., shipwright—French (3d)
1173—Cocker, Edwin, 18, Staleybridge M.I., pupil teacher—Arith. (3d): Geog. (3d)
1093—Cole, Frederic T., 18, Southampton Ath., chemist—Arith. (3d)
1025—Collinge, Samuel, 24, Salford W.M. Coll., cashier—Bkpg. (2d); French (3d)
853—Collins, John, 17, Manchester M.I., silversmith—Bkpg. (2d)
85—Collins, Joseph, 18, Birm. and Midl. Inst., die sinker—Eng. Lit. (2d)
788—Collins, William E., 22, Lond. M.I., law clerk—Arith. (1st)
22—Connan, William, 18, Aberdeen M.I., architect (apprentice)—French (2d)
1212—Conning, James, 25, Greenwich Lit. Inst., ship-wright—Geom. Dwg. (2d)
953—Connor, John, 39, Paisley Artiz. Inst., carpet weaver—Music (2d)
799—Cook, Charles S., 16, Lond. M.I., clerk—French (3d); Geog. (3d)
984—Coop, John, 27, Oldham Lyceum Sch. of Sci. and Art, fitter—Geom. Dwg. (3d)
1141—Cooper, Tom, 16, Messrs. Chance's Library, clerk—Arith. (3d)
86—Cope, Charles, 27, Birm. and Midl. Inst., miller's clerk—French (3d)
1024—Corcoran, John, 19, Salford W.M. Coll., hackle setter—Bkpg. (3d)
293—Cottee, John W., 19, Chelmsford Lit. and Mech. Inst., auctioneer's clerk—Bkpg. (1st); Pract. Mech. (3d)
1143—Cotterell, John, 22, Messrs. Chance's Library, glass painter—Freehand Dwg. (2d)
791—Cox, James E., 21, Lond. M.I., accountant's clerk—Eng. Hist. (2d); Geog. (2d)
679—Cox, William, 19, Young Men's Christian Assoc., Aldersgate-street, clerk—Arith. (1st)
185—Cox, William N., 22, Bristol Trade School, clerk—Geom. Dwg. (3d)
643—Craddock, Joseph, 26, Lichfield W.M. Assoc., colliery clerk—Bkpg. (1st)
508—Craig, John, 16, Glasgow Inst., law clerk—Bkpg. (1st); Arith. (2d); Geog. (2d)
1219—Crament, John M., 20, York M.I., school teacher—Music (1st)
198—Cross, Francis R., 18, Bristol Trade School, medical student—Chem. (2d)
207—Crossley, Jonas, 19, Burnley M.I., weaver—Arith. (3d); Bkpg. (3d)
297—Cuff, Frank, 24, Christchurch W.M.I., mercantile clerk—Arith. (1st); Bkpg. (1st)
1026—Cullum, William T., 18, Salford W.M.C., merchant's clerk—Bkpg. (2d)
443—Cullwick, Benjamin, 28, Hastings M.I., watch-maker—Eng. Hist. (2d); Eng. Lit. (2d); Arith. (3d)
247—Cumming, Douglas G., 20, Burrage-road Evg. Classes, turner and fitter—Geom. Dwg. (2d)
556—Cunningham, John R., jun., 17, Glasgow M.I., merchant...Eng. Lit. (2d)
681—Curtis, Edwin R., 21, City of Lond. Coll., clerk—French (2d)
1225*—Cuthbert, George, 20, York Inst., shoemaker—Bkpg. (2d)

491—Cuthbertson, Thomas, 18, Glasgow Ath., clerk—French (2d)

36—Dale, John, 32, Alderley-edge Educ. Inst., joiner and cabinet maker—Arith. (3d); Music (3d)
449—Dalton, Edwin J., 17, Hull Young People's Inst., clerk—Eng. Hist. (3d)
493—Dansken, Alexander B., 20, Glasgow Ath., civil and mining engineer (apprentice)—Arith. (3d)
50—Darley, William H., 17, Alton M.I., turner—Eng. Hist. (1st); Arith. (2d); Geog. (2d)
1028—Davies, Alfred, 18, Salford W.M. Coll., clerk—Bkpg. (2d)
313—Davies, Alfred H., 19, Crewe M.I., apprentice fitter—Geom. Dwg. (2d); Pract. Mech. (3d)
1180—Davies, George W., 27, Stockport M.I., iron moulder—Arith. (2d)
1027—Davies, William, 18, Salford W.M. Coll., clerk—Arith. (3d)
1122—Davies, William, 18, Woodside and Harts'-hill Inst., pupil teacher—Arith. (2d); Geog. (2d); Bkpg. (3d)
55—Davis, James S., 18, S.E.R. M.I., railway clerk—Arith. (3d)
827—Day, Alfred, 27, Roby Lit. and Educ. Soc., joiner—Geom. Dwg. (3d)
682—Day, Thomas J., 26, City of Lond. Coll., clerk—Bkpg. (2d)
1098—Dean, Alexander, 34, Southampton Ath., gardener—Fruit and Vegetable Culture (3d)
654—Deller, William, 19, Lichfield W.M. Assoc., proctor's clerk—Music (2d); Free-hd. Dwg. (2d)
533—Dempster, James K., 27, Glasgow M.I., arch. draughtsman—Botany (2d)
560—Dempster, Samuel W., 24, Glasgow M.I., clerk—Eng. Lit. (3d)
1030—Dickson, Joseph, 23, Salford W.M. Coll., clerk—Bkpg. (2d)
279—Dobson, Thomas G., 19, Carlisle M.I., clerk—Arith. (3d)
974—Dodd, Thomas J., 18, Watt Inst., Portsea, shipwright (apprentice)—Arith. (1st); Alg. (2d); Geom. (2d); Conic Sec. (3d)
217—Dodgson, William, 20, Burnley M.I., engineer (apprentice)—Alg. (3d)
1077—Dorrell, Henry B., 19, Slough M.I., carpenter and joiner—Geom. Dwg. (1st) with 2d prize; Free-hd. Dwg. (2d)
1193—Douglas, John G., 18, West Hartlepool M.I., clerk—Eng. Hist. (2d); Eng. Lit. (2d); Geom. (2d)
259—Dow, William, 16, Burrage-road Evg. Classes, iron turner—Geom. Dwg., (2d)
469—Downie, James, jun., 17, Glasgow Ath., clerk—French (2d)
1152—Drew, Samuel, jun., 21, Walsall Church Inst., butcher—Bkpg. (2d); Mensur. (3d)
531—Drummond, Alexander, 21, Glasgow M.I., clerk—Eng. Hist. (3d)
387—Drummond, George, 22, Halifax M.I., post-office stamper—Eng. Lit. (2d)
378—Duckworth, Walter, 19, Farnworth and Kersley M.I., cashier's clerk—Arth. (3d)
1138—Dudley, Samuel W., 16, Messrs. Chances' library, glass painter—Free-hd. Dwg. (3d)
245—Duerden, John W. N., 19, Burnley Ch. of Eng. Lit. Inst., pupil teacher—Animal Phys. (1st)
250—Duff, Charles, 37, Burrage-road Evg. Classes, litho. printer—Geom. Dwg. (2d)
1142—Dugmore, William, 23, Messrs. Chances' Lib., glass painter—Free-hd. Dwg. (2d)
683—Duly, William J. 18, City of Lond. Coll., clerk—Arith. (1st); Bkpg. (2d)
789—Duncan, John, 22, Lond. M.I., gardener—Botany (2d) with the Roy. Horticul. Soc. prize of £5; Floriculture (2d)
598—Duningham, Albert, H. 22, Ipswich W.M.C.—Bkpg. (3d)
1089—Dunnell, Henry, 30, Southampton Ath., boiler-maker—Arith. (3d)
814—Dunster, Thomas, 16, St. Stephen's (Westm.) Ev. Sch., pupil teacher—Arith. (3d)
500—Dyer, Henry, 18, Glasgow Inst., engineer (apprentice)—Geom. (1st)

51—Eden, John W., 16, S.E. Rwy. M.I., railway clerk—Arith. (1st)
295—Edey, George, 19, Christchurch W.M. Inst, chemist—Chem. (2d)
961—Edwards, Thomas, 17, Pembroke Dock M.I., shipwright (apprentice)—Alg. (1st) with 1st prize; Mens. (1st): Trig. (2d)
833—Elliott, Thomas G., 17, Manchester M.I., engineer—Chem. (2d); Mens. (3d)
339—Ellis, Charles J., 26, Devonport M.I., shipwright—Geom. (2d)
684—Ellis, James F., 18, City of London Coll., lithographer—French (3d)
813—Ellis, Walter J., 17, St. Stephen's (Westm.) Evg. Sch., pupil teacher—Arith (2d)
817—Elsom, Albert, 19, Louth M.I., pupil teacher—Alg. (3d)
1033—Entwisle, Thomas B., 18, Salford W.M. Coll, clerk—Bkpg. (2d)
969—Entwistle, Joseph, 22, Swinton M.I., road labourer—Arith. (2d)
768—Evans, George, 27, Roy. Polyt. Inst., butcher—Arith. (2d); Dom. Econ. (2d)
383—Evans, John, 16, Farnworth and Kersley M.I, moulder—Arith. (3d)

536—Falconer, Alexander N., 20, Glasgow M.I., clerk—Bkpg. (2d)
8—Falconer, William, 18, Aberdeen M.I., draper—French (3d)
265—Farlie, Charles J., 26, Burrage-road Evg. Classes, draughtsman—Geom. Dwg. (1st) with 1st prize
1002—Farrar, Samuel, 26, School of Sci. and Art, Oldham Lyceum, iron moulder—Geom. Dwg. (3d)
743—Faulkner, Richard, 23, City of Lond. Coll., bank clerk—Music (1st)
141—Field, George H., 20, Bradford M.I., printer—Geog. (2d); Eng. Hist. (3d)
197—Finch, William J., 17, Bristol Trade School, manufacturing chemist—Chem. (1st)
494—Finlay, John, 21, Glasgow Inst., warehouseman—Bkpg. (2d)
603—Fisk, Henry W., 16, Ipswich W.M.C., attorney's clerk—Bkpg. (2d)
41—Fitzgerald, David, 24, Guildford Inst., clerk and draughtsman—Lat. and Rom. Hist. (1st) with 1st prize; Arith. (2d)
1034—Flevell, Henry, 20, Salford W.M. Coll., clerk—Bkpg. (3d)
574—Forbes, Daniel W., 19, Glasgow M.I., mechan. engineer—Geom. (3d)
593—Forbes, Peter, 24, Pop. Ev. Classes, And. Un., Glasgow, chemical student—Chem. (3d)
341—Ford, Francis, 18, Devonport M.I., engineer student—Geom. (2d); Alg. (3d)
686—Forsaith, Josiah C., 18, City of Lond. Coll., banker's clerk—Free-hand Dwg. (3d)
363—Foulkes, Robert, 27, Droylsden Educ. Inst., joiner—Geom. Dwg. (2d)
637—Foxcroft, George H., 22, Leeds Y. Men's Christ. Assoc.—Geog. (1st); Arith. (3d); Bkpg. (3d)
528—Frame, Alexander, 27, Glasgow M.I., cashier—Spanish (2d)
60—Fry, Howard, 20, S.E.R. Mech. Inst., engine fitter—Pract. Mech. (2d)
786—Furmage, Francis D., 20, Lond. M.I., law clerk—Arith. (3d)

525—Galbraith, Robert, 22, Glasgow M.I., mechanic—Arith. (2d)

1198—Gardner, Charles R., 18, Woolwich R. Arsenal, M.I., fitter and turner—Geom. Dwg. (3d)
998—Gartside, James, 16, School of Sci. and Art, Oldham Lyceum, millwright apprentice—Geom. Dwg. (2d)
988—Gartside, Samuel, 28, School of Sci. and Art, Oldham Lyceum, iron turner—Geom. Dwg. (2d)
994—Gartside, William, 19, School of Sci. and Art, Oldham Lyceum—Geom. Dwg. (3d)
417—Gaukroger, James, 16, Haley-hill Wkg. Men's Inst. (Halifax), clerk—Bkpg. (1st); Arith. (2d)
1170—Gee, Henry, 20, Staleybridge M.I., power-loom weaver—Bkpg. (3d)
687—Genge, James C., 17, City of London Coll., clerk—Spanish (1st with 1st prize); French (3d)
843—Gentles, Adam, 20, Manchester M.I., coach-maker—Geom. Dwg. (3d)
688—George Frederick C., 20, City of London Coll., clerk—French (3d)
689—George, J. B., 16, City of London Coll., clerk—Spanish (1st); German (3d); French (3d)
370—Gibbons, John, 27, Droylsden Educ. Inst., joiner—Geom. Dwg. (3d)
57—Giles, Richard R., 17, S.E.R. Mech. Inst., railway clerk—Arith. (1st)
944—Gill, James, 23, Paisley Artiz. Inst., shawl pattern designer—Music (2d)
655—Gladman, John, 17, Lichfield W.M. Assoc., bandsman—Music (2d)
404—Glasby, Charles, 16, Halifax W.M. Coll., packer—Bkpg. (3d)
1035—Glover, Walter T., 19, Salford W.M. Coll., cashier—Bkpg. (1st)
292—Godseff, Joseph, 19, Chelmsford Lit. and Mech. Inst., gardener—Botany (3d)
*974—Godward, Edward, 24, New Mills W.M. Inst.—Pol. and Soc. Econ. (3d)
1160—Galby, Thomas, 18, Wolverhampton Ath., clerk—Bkpg (2d); French (3d)
947—Goldie, James, 27, Paisley Artiz. Inst., joiner—Music (3d)
690—Goodyear, James H., 18, City of Lond. Coll., clerk—German (1st) with 2nd prize; French (3d)
342—Goodyear, Thomas H., 19, Devonport M.I., engineer student—Trigon. (1st) with 1st prize; Alg. (2d)
626—Goodall, Hamilton, 17, Leeds M.I., mechanical engineer—Arith. (1st); Geom. (2d); Alg. (3d)
818—Gordon, Joel, 24, Macclesfield Useful Knowl. Soc., silk-sizer—Arith. (3d)
302—Gornall, James, 20, Clitheroe M.I., spinner—Bkpg. (1st); Arith. (3d)
309—Gornall, John, 24, Clitheroe M.I., spinner—Arith. (3d)
1208—Gorrie, Daniel, 28, Greenwich Lit. Inst., joiner—Geom. Dwg. (2d)
828—Gough, Patrick, 23, Hulme W.M. Inst., warehouseman—Navig. and Naut. Ast. (3d); Alg. (3d)
564—Graham, Duncan, 16, Glasgow M.I., pupil teacher—Bkpg. (3d)
234—Grant, James, 16, Burnley Church of Eng. Lit. Inst., assistant teacher—Eng. Hist. (1st); Anim. Phys. (1st); Geog. (2d)
527—Grant, James, 24, Glasgow M.I., warehouseman—Latin and Rom. Hist. (3d)
220—Gray, Alexander, 21, Burnley M.I., weaver—Bkpg. (3d)
945—Gray, Matthew, 23, Paisley Artiz. Inst., coal agent—Music (3d)
691—Gray, Walter, 19, City Lond. Coll., clerk—Bkpg, (1st)
88—Green, Edmund, 20, Birm. and Midl. Inst., clerk—French (3d)
*266—Green, Thomas, 21, Burrage-road Evg. Classes, turner—Geom. Dwg. (3d)
692—Green, Thomas B., 19, City of Lond. Coll., clerk—French (3d)
625—Green, Thomas W., 28, Leeds M.I., clerk—Bkpg. (2d)
1007—Greenhalgh, Henry, 20, Werneth M.I., clerk—Arith. (1st)
389—Greenwood, Charles, 19, Halifax M.I., printer—Bkpg. (3d)
411—Greenwood, David, 16—Halifax W.M. Coll., clerk—Arith. (1st); Bkpg. (1st)
34—Greenwood, Holmes, 18, Accrington M.I., warehouseman—Arith. (2d); Alg. (3d)
860—Greenwood, William H., 20, Manchester M.I., engineer (apprentice)—Light and Heat (2d); Prac. Mech. (2d); Princ. Mech. (3d)
343—Gribble, Herbert K., 19, Devonport M.I., architect's pupil—Freehand Dwg. (1st; with 1st prize
965—Griffiths, Henry, 24, Pembroke Dock M.I., shipwright—Alg. (2d)
53—Griffiths, William H., 17, S.E.R. Mech. Inst., railway clerk—Bkpg. (1st); Alg. (3d.)
602—Grimwade, John H., 17, Ipswich W.M.C., woollen draper—Bkpg. (2d)
632—Guest, Thomas, 18, Leeds M.I., clerk—Chem. (2d)
647—Guttridge, Thomas, jun., 24, Lichfield W.M. Assoc., grocer's assistant—Bkpg. (3d)

1169—Hadfield, James, 19, Staleybridge M.I., piecer—Arith. (2d); Bkpg. (3d)
1184—Hadfield, Joshua H., 19, Stockport M.I., clerk—Arith. (3d)
416—Haley, Edward, 16, Halifax W.M. Coll., wool-sorter—Arith. (1st); Bkpg. (1st)
785—Hall, Alfred R., 18, Greville House Inst., chemist Chem. (1st) with 2d prize
445—Hall, Edward M., 16, Hertford Lit. and Sci. Inst., clerk—Arith. (3d)
1236—Hall, John, 16, Stourbridge Ch. Inst., printer—Arith. (3d)
1186—Hall, Matthew, 19, Thirsk M.I., mining engineer—Arith. (3d)
1111—Hamilton, William F., 17, Southampton Ath., surveyor's clerk—Arith. (2d)
1181—Hand, John E., 18, Stockport M.I., mechanic—Arith. (2d)
1036—Hardman, James, 21, Salford W.M. Coll., clerk—Arith. (3d)
693—Harding, Charles, 20, City of Lond Coll., clerk—French (3d)
1230—Harding, Henry W., 16, Kidderminster Ch. of Eng. Inst., pupil teacher—Arith. (3d)
782—Hardy, Frederick, 17, Roy. Polyt. Inst., clerk—Geom. (3d)
212—Hargreaves, Edmund, 20, Burnley M.I., weaver—Arith. (2d); Bkpg. (3d)
1000—Hargreaves, Edward, 18, School of Sci. and Art., Oldham Lyceum, mechanic—Geom. Dwg. (3d)
208—Hargreaves, Crawshaw, 19, Burnley M.I. weaver—Bkpg. (3d)
548—Harper, William, 20, Glasgow M.I., apprentice measurer—Arith. (3d)
238—Harrison, Horatio, 19, Burnley Ch. of Eng. Lit. Inst., gardener—Anim. Phy. (2d)
769—Harrison, James H., 18, Royal Polyt. Loc. Bd., clerk—Latin and Rom. Hist. (3d)
152—Harrison, Joseph, 24, Bradford M.I., woolsorter—Bkpg. (2d)
1009—Harrison, Joseph E., 18, Oldham Lyceum, draughtsman—Bkpg. (2d); Pract. Mech. (2d); Arith. (3d); Geom. (3d)
646—Harrison, Matthew F., 16, Lichfield W.M. Assoc., chorister—Bkpg. (2d)
1134—Harrison, Thomas W., 31, Messrs. Chances' Library, draughtsman—Geom. Dwg. (3d)
770—Harrison, Walter H., 19, Roy. Poly. Loc. Bd.—clerk—Alg. (3d)

400—Hartley, Anthony, 19, Halifax M.I., clerk—Bkpg. (2d)
423—Hartley, William, 18, Halifax W.M. Coll., woolsorter—Bkpg. (3d)
568—Harvey, Robert, 17, Glasgow M.I., engineer—Geom. (3d)
90—Haseler, George C., jun., 20, Birm. and Midl. Inst., jeweller—Chem. (2d)
91—Haseler, Leopold, F., 16, Birm. and Midl. Inst., clerk—Chem. (2d)
1151—Hateley, Arthur, 16, Bradford-street, Walsall, Lit. Inst., brass founder—Geog. (3d)
943—Hattrick, Alexander, 22, Paisley Artz., Inst.—Music (3d)
263—Hawes, Joseph W., 38, Burrage-road Evg. Classes, brass finisher—Geom. Dwg. (3d)
48—Hawkins, William, 17, Alton M.I., pupil teacher—Geog. (3d)
215—Haworth, Frank, 16, Burnley M.I., book-keeper—Bkpg. (3d)
111—Haworth, Thomas, 18, Accrington and Blackburn Inst., assistant teacher—Arith. (1st); Eng. Hist. (1st); Geog. (2d)
432—Haworth, Thomas, 23, Haslingden M.I., cotton weaver—Anim. Phys. (3d)
694—Hazelton, Philip, 17, City of Lond. Coll., clerk—French (2d)
344—Hearson, Thomas A., 17, Devonport M.I., naval engineer—Geom. (1st)
820—Heathcote, George, 18, Macclesfield M.I., pupil teacher—Geog. (2d); Arith. (3d)
409—Hebblethwaite, Joseph, 17, Halifax W.M. Coll., woolsorter—Bkpg. (2d)
415—Hebblethwaite, Samuel, Halifax W.M. Coll., woolsorter—Arith. (2d)
470—Henderson, Thomas J., 19, Glasgow Ath., Clerk—French (1st)
1243—Henderson, William, 19, People's Lit. Inst., Belfast, clerk—French (3d)
898—Hendrie, Robert, 22, Manch. M.I., assistant clerk—Bkpg. (3d)
695—Hensler, William, 21, City of Lond. Coll., chemist's assistant—Arith. (3d)
1210—Hepburn, Richard, 22, Science Sch. R. Arsenal, Woolwich, engine fitter—Geom. Dwg. (2d)
329—Hewett, Robert, 28, Derby W.M. Asso., schoolmaster—Bkpg. (1st); Arith. (2d)
92—Hewitt, James E., 20, Birm. and Midl. Inst., jeweller—French (3d)
892—Heyworth, Edward, 16, Manch. M.I., warehouseman—Bkpg. (2d)
326—Hibbert, John, 21, St. Peter's Evg. Sch., Derby—book-keeper—Arith. (2d)
696—Higgin, Charles C., 19, City Lond. Coll., clerk—French (1st)
*246—Higgin, William, 17, Burnley M.I., land surveyor's assistant—Arith. (3d)
662—Higginbottom, James, 20, Liverpool Coll., clerk—Arith. (2d)
1092—Higgs, John C., 25, Southampton Ath., gardener—Fruit and Vegetable Culture (3d)
697—Hill, George, 23, City of Lond. Coll., clerk—Geom. (2d)
838—Hill, Henry E., 21, Manch. M.I., mechanical draughtsman—Arith. (2d): Pract. Mech. (3d)
52—Hill, John, 22, S.E. Rway. M.I, railway clerk—Arith. (1st); Alg. (1st)
*73—Hill, John, 20, Baccup M.I., piece-looker—Arith. (1st)
1119—Hill, Samuel T., 22, Messrs. Bagnall's Inst., Gold's Hill, schoolmaster—Music (2d)
*34—Hill, William, 19, Acomb Lit. Inst., clerk—Arith. (3d)
446—Hills, Henry G., 23, Hertford Lit. and Sci. Inst., printer—Mensur. (2d)
112—Hindle, Thomas, 22, Blackburn M.I., power-loom weaver—Arith. (3d)
1146—Hipwood, Thomas, 18, Stourbridge Assoc. Inst., engine fitter—Arith. (3d); Free-hd. Dwg. (3d)
777—Hoard, William C., 16, Roy. Polyt. Inst., clerk—French (3d)
846—Holaway, George L., 17, Manch. M.I., pupil teacher—Geog. (2d)
235—Holden, Thomas, 22, Burnley Ch. of Eng. Lit. Inst., postman—Bkpg. (1st); Anim. Phys. (3d)
221—Holgate, James, 20, Burnley M.I., clerk—Alg. (3d)
382—Holland, William, 19, Farnworth and Kersley M.I., spindle turner—Arith. (3d)
1071—Hollinshed, George, 16, Salford W.M. Coll., clerk—Bkpg. (3d)
93—Holloway, George O'Connor, 19, Birm. and Midl. Inst., merchant's clerk—Spanish (1st)
746—Holloway, William H., 21, Roy. Polyt. Inst., clerk—Chem. (3d)
700—Holman, William, 23, City of Lond. Coll., clerk—German (1st) with 1st prize
863—Hompes, Leo, 16, Manch. M.I., clerk—Chem. (2d); Anim. Phys. (3d)
328—Hopkins, Edward, 19, Burton Lit. Soc., attorney's clerk—Geog. (1st); Arith. (2d); Eng. Hist. (3d); Eng. Lit. (3d)
321—Hopkins, John, 17, Burton Lit. Soc., clerk—Arith. (3d); Geog. (3d)
1161—Hough, Joseph, 28, Wolverhampton Ath., assistant in observatory—French (2d); Con. Sec. (3d)
1228—Howard, John, 18, Kidderminster Ch. of Eng. Inst., cabinet-maker—Freehand Dwg. (2d)
859—Howard, Joseph B., 19, Manch. M.I., mechanic—Geom. Dwg. (2d)
872—Howarth, James, 20, Manch. M.I., clerk—Eng. Hist. (3d)
126—Howarth, Walter, 16, Bolton M.I., millwright—Geom. Dwg. (2d)
320—Howarth, William, 18, Dean Mills M.I.—Arith. (3d)
701—Howe, William, 27, City of Lond. Coll., com. clerk—Bkpg. (2d)
702—Howell, Jonathan, 22, City of Lond. Coll., clerk—Bkpg. (1st)
408—Howorth, Samuel C., 23, Halifax W.M. Coll., weaver—Bkpg. (1st); Arith. (3d)
703—Hudson, William, City of Lond. Coll., teacher—French (3d)
1263—Hudson, William B., 18, Faversham Inst., pupil teacher—Arith. (2d); Geog. (2d)
94—Hughes, Hesketh, 48, Birm. and Midl. Inst., engineer—French (3d)
704—Hughes, John, 22, City of Lond. Coll., assistant in a laboratory—Anim. Phys. (1st) with 1st prize; Chem. (2d)
755—Hughes, Mary C., 21, Roy. Polyt. Inst.—Eng. Lit. (2d)
1128—Hughes, Thomas, 29, Woodside and Hart's Hill Inst., colliery engine driver—Arith. (3d)
332—Hunt, William, 20, Derby M.I., clerk—Bkpg. (2d); Arith. (3d)
19—Hunter, Andrew C., 22, Aberdeen M.I., clerk—French (2d)
20—Hunter, George S., 19, Aberdeen M.I., stonecutter—Free-hand Dwg. (3d)
1221—Hunter, Henry L., 19, York Institute, teacher—Alg. (3d)
502—Hunter, James, 30, Glasgow Inst., clerk—Bkpg. (2d)
705—Hurditch, Thomas, 24, City of Lond. Coll., reader—French (3d)
1041—Hurst, Daniel, 20, Salford W.M. Coll., clerk—Arith. (2d)
752—Hutchinson, William M., 24, Roy. Polyt. Inst., assistant—Elect. and Mag. (3d); Chem. (3d)

429—Ingham, James, 23, Halifax W.M. Coll., carpet-weaver—Bkpg. (3d); Eng. Lit. (3d)

257—Jack, Alexander G. McK., 16, Burrage-road Evg. Classes, iron turner—Geom. Dwg. (3d)
1205—Jack, John C., 17, Science School, R. Arsenal, Woolwich, turner—Geom. Dwg. (3d)
454—Jackson, William, 28, Hull Young People's Inst., teacher—Music (1st); Arith. (3d)
25—Jamieson, Thomas, 18, Aberdeen M.I., clerk—French (2d)
589—Jardine, John, 25, Pop. Ev. Classes, And. Un., Glasgow, engineer—Pract. Mech. (3d)
608—Jefferys, Alexander G., Ipswich W.M.C., clerk—Bkpg. (1st)
1043—Jenkinson, William M., 19, Salford W.M. Coll., clerk—Bkpg. (2d)
1199—Jenner, William, 23, Science School, R. Arsenal, Woolwich, labourer—Chem. (3d)
1260—Jepson, Henry, 17, Newcastle-on-Tyne Ch. Inst., clerk—Geog. (3d)
1097—Jessop, George F., 16, Southampton Ath., clerk—Geog. (3d)
707—Jewesbury, Frederick N., 18, City of Lond Coll., clerk.—Eng. Lit. (1st) with 1st prize; chem. (2d)
858—Johnson, John W.. 20, Manchester M.I., book-keeper—French (3d)
3—Johnston, Robert, 21, Aberdeen M.I., clerk—Bkpg. (2d)
964—Jones, Alfred, 16, Pembroke Dock M.I., clerk in Civil Service—Arith. (2d); Eng. Hist. (2d); Geog. (3d)
96—Jones, David P., 27, Birm. and Midl. Inst., clerk—Arith. (3d)
1226—Jones, John, 18, Kidderminster Ch. of Eng. Inst., pupil teacher—Geog. (2d); Eng. Hist. (3d)
869—Jones, Thomas, 21, Manch. M.I., clerk—Arith. (2d)
1044—Jones, Thomas, 16, Salford W.M. Coll., clerk—Arith. (3d)
1045—Jones, Thomas, 22, Salford W.M. Coll., photo-instrument-maker—Geom. Dwg. (1st); Chem. (3d)
966—Jones, William, 33, Pembroke Dock M.I., leading man of shipwrights—Mensur. (1st)
1046—Jordan, Thomas, 25, Salford W.M. Coll., clerk—Bkpg. (2d)
1075—Judd, John T., 17, Slough M.I., harness-maker—Freehand Dwg. (3d)
1083—Judd, William, 19, Slough M.I., harness-maker—Freehand Dwg. (3d)
1264—Judges, John, jun., 17, Faversham Inst., pupil teacher—Arith. (3d)

414—Kane, John, 21, Halifax W.M. Coll., clerk—Bkpg. (3d); Eng. Lit. (3d)
1047—Kay, Reuben, 20, Salford W.M. Coll., clerk—Arith. (2); French (3d)
359—Kay, William, 16, Droylsden Educ. Inst., warehouseman—Geom. Dwg. (2d); Chem. (3d)
144—Kaye, Uriah, 19, Bradford M.I., woolsorter—Mensur. (2d)
1222—Kendall, James, 21, York Inst., cabinet-maker—Freehand Dwg. (3d)
473—Kennedy, David C., 16, Glasgow Ath., clerk—Arith. (2d)
538—Kennedy, James, 17, Glasgow M.I., joiner—Geom. (3d)
709—Kennedy, John, 21, City of Lond. Coll., clerk in H.M. Customs—Eng. Lit. (1st) with 2d prize
609—Kidney, John, 16, Leeds M.I., clerk—Arith. (2d); Geom. (2d); Alg. (3d)
455—Kingston, Robert C., jun., 19, Hull Christ. and Lit. Inst., gardener—Botany (3) with the Roy. Horticult. Soc. prize of £1; Fruit and Veget. Cult. (2d); Floricult. (3d); Bkpg. (3d)
885—Kirkham, James, 27, Manchester M.I., clerk—Bkpg (1st)

557—Laird, John, 18, Glasgow M.I., clerk—Eng. Lit. (3d)
710—Langmann, Otto, 19, City of London Coll., clerk—Bkpg. (2d)
778—Langoré, Juliette, 21, Royal Poly. Inst., governess—Italian (2d)
484—Laughland, James, 20, Glasgow Ath., clerk—Eng. Lit., (2d)
771—Law, Charles A., 24, Royal Poly, Inst., clerk—French (3d)
1049—Lawton, Robert, jun., 19, Salford W.M. Coll., clerk—French (3d)
28—Ledingham, James D., 20, Aberdeen M.I., mechanic—Alg. (3d)
864—Lee, Thomas, 21, Manchester M.I., salesman—Eng. Hist. (2d)
360—Lees, Robert W., 17, Droylsden Educ. Inst., pupil teacher—Geo. (2d); Geom. Dwg. (3d); Chem. (3d)
545—Leslie, James, jun., 20, Glasgow M.I., clerk—Freehand Dwg. (3d)
1080—Lewis, Owen W., 16, Slough M.I., carpenter—Geom. Dwg. (2d)
617—Linney, William, 19, Leeds M.I., clothier's assistant—Elec. and Mag. (3d)
520—Litster, William, 18, Glasgow M.I., warehouseman—Spanish (2d)
830—Littler, Peter, 26, Christchurch (Hulme) Inst., clerk—Arith. (2d)
711—Liversidge, Archibald, 19, City of London Coll., warehouseman's assistant—Chem. (2d); Animal Phy. (2d)
949—Lockie, Joseph, 22, Paisley Artz. Inst., weaver—Music (3d)
1050—Lomas, Edwin, 19, Salford W.M. Coll., weaver—Bkpg. (2d); French (3d)
269—Lomax, Ernest D., 16, Bury Ath., pupil teacher—Freehand Dwg (3d)
67—Lord, Caleb, 18, Bacup, M.I., joiner—Arith. (3d)
276—Lord, George, 23, Bury Ath., mechanic—Geom. Dwg. (3d)
848—Lowe, Frederick, 20, Manch. M.I., clerk—Bkpg. (2d)
397—Lumb, William E., 22, Halifax M.I., storekeeper—Eng. Lit. (2d)
712—Lyon, Robert, 16, City of London Coll., clerk—French (2d)

1245—McCullough, John, 16, Belfast Work. Classes Assoc., apprentice in linen warehouse—French (3d)
1091—McFadden, Rowland, 20, Southampton Ath., engraver (Ordnance Survey)—Freehand Dwg. (1st) with 2d prize
565—McGregor, David S., 16, Glasgow M.I., pupil teacher—Bkpg. (3d)
231—McKay, James, 18, Burnley M.I., clerk—Bkpg. (3d); Eng. Lit. (1st)
940—McLauchlan, William, 34, Paisley Artizans' Inst., tailor—Music (2d)
543—McLean, Hector, 19, Glasgow M.I., clerk—French (3d)
488—McMurtrie, John, 19, Glasgow Ath., clerk—Bkpg. (1st); Arith. (2d)
946—McNaughtan, Alexander, 20, Paisley Artizans' Inst., joiner—Music (3d)
570—McNeil, John, 20, Glasgow M.I., engineer—Algebra (3d)
1246—McNeill, Henry, 16, People's Lit. Inst., Belfast, teacher—Arith. (2d)
1242—McNeill, James, 19, People's Lit. Inst., Belfast, national school teacher—Trig. (1st); Alg. (1st); Geom (1st)
935—McQueen, John, Paisley Artizans' Institute—French (3d)
497—Mac Kinlay, David, 24, Glasgow Inst., clerk—Latin and Rom. Hist. (2d)
958—Macarthur, Angus, 25, Paisley Artiz. Inst., foreman of weavers—Music (2d)

498—Macbeth, Hugh, 26, Glasgow Inst., bookbinder—Freehand Dwg. (3d)

582—Macdonald, Peter, 17, Pop. Ev. Classes, And. Un., Glasgow, civil engineer—Freehand Dwg. (1st); Geom. Dwg. (3d)

550—Macdougall, John S., 17, Glasgow M.I., clerk—French (3d)

750—Macgillivray, Robert, 24, Roy. Polyt. Inst., cabinet maker—Min. and Met. (3d); Chem. (3d)

252—Machen, William J., 26, Burrage-road Evg. Classes, carpenter—Geom. Dwg. (3d)

503—Mackay, Daniel, 21, Glasgow Inst., railway clerk—Bkpg. (3d)

713—Mackintosh, William, 19, City of Lond. Coll., bank clerk—Bkpg. (2d); French (3d)

714—Maidstone, Richard, 23, City of Lond. Coll., clerk—Bkpg. (1st); French (3d)

561—Mair, John, 21, Glasgow M.I., warehouseman—Eng. Lit. (3d)

715—Mallett, William, R. 21, City of Lond. Coll., surveyor's clerk—Geom. Dwg. (2d)

535—Mann, Wingate R., 23, Glasgow M.I., clerk—French (3d)

199—Marks, Philip W., 19, Bristol Trade School, oil and colourman—Chem. (3d)

401—Marples, Theophilus, 18, Halifax M.I., pawnbroker's assistant—Bkpg. (3d)

990—Marsden, Thomas, 18, School of Sci. and Art., Oldham Lyceum, pattern maker—Geom. Dwg. (3d)

529—Marshall, Alexander S., 20, Glasgow M.I., clerk—Bkpg. (1st)

499—Marshall, Charles, 19, Glasgow Inst., measurer—Free-hand Dwg. (3d)

530—Marshall, John S., 16, Glasgow M.I., warehouseman—Bkpg. (1st)

294—Marshall, Moses, 27, Christchurch M.I., plumber—Arith. (3d); Alg. (3d)

554—Martin, Alexander, 22, Glasgow M.I., clerk—Eng. Lit. (3d)

975—Martin, Frederick, 20, Watt Inst., Portsea, shipwright (apprentice)—Alg. (1st); Arith. (2d); Geom. (2d); Con. Sec. (3d)

650—Martin, George, 21, Lichfield W.M. Assoc., carriage painter—Free-hand Dwg. (2d)

450—Martin, John, 18, Hull Young People's Inst., merchant's clerk—Mens. (2d)

787—Martin, William, 17, Lond. M.I., engineer's clerk—French (3d)

716—Masham, William G., 25, City of Lond. Coll., clerk—Geom. (2d)

129—Mason, George, 25, Bolton M.I., engineer—Princ. Mech. (3d)

1099—Massy, William L., 19, Southampton Ath., clerk H.M. Customs—Mens. (1st) with 2d prize

717—Mathew, John F., 27, City of Lond. Coll., clerk—Bkpg. (1st); French (3d)

963—Mathias, George H., 24, Pembroke Dock M.I., writer—Bkpg. (2d); Geog. (2d)

920—Maude, John, 19, Mossley M.I., piecer—Bkpg. (2d)

815—Mawer, Samuel, 17, Louth M.I., pupil teacher—Geog. (2d)

816—Mawer, Walter, 18, Louth M.I., printer—Alg. (3d)

1201.—May, William, 27, Sci. Sch., R. Arsenal, Woolwich, fitter—Chem. (3d)

718—Meadows, William, 18, City of Lond. Coll., clerk—Navig. and Naut. Astr. (1st) with 1st prize; Alg. (1st); Pract. Mech. (1st) with 1st prize

719—Medhurst, John T., 19, City Lond. Coll., clerk—Arith. (2d); French (2d)

879—Mellody, Edwin, 21, Manch. M.I., sketchmaker—Bkpg. (2d); Arith. (3d)

399—Midgeley, Samuel, 21, Halifax M.I., leather salesman—Bkpg. (3d)

514—Millar, William J., 26, Glasgow M.I., collector—Prin. Mech. (3d)

1053—Mills, Henry, 22, Salford W.M. Coll., clerk—Arith. (3d)

836—Mills, John, 18, Manchester M.I., porter—Bkpg. (2d)

1052—Mills, William, 18, Salford W.M. Coll., clerk—Bkpg. (1st)

539—Milne, James M., 19, Glasgow M.I.—Chemi[st] Chem. (3d)

1256—Minnis, Samuel A., 25, Banbridge Lit. Soc., Pe[tty] law officer—Eng. Lit. (3d); Geog. (3d)

883—Mitchell, George, 24, Manchester M.I., book-keeper—Bkpg. (1st)

486—Moir, Charles S., 17, Glasgow Ath., clerk—Fren[ch] (2d)

480—Montgomerie, Robert, 21, Glasgow Ath., clerk—Music (1st)

720—Morgan, Hugh, 19, City of Lond. Coll., clerk—Eng. Lit. (1st); Geog. (2d)

973—Morgan, Lewis, 20, Watt Inst., Portsea, ship-wright (apprentice)—Arith. (2d); Eng. Hi[st.] (3d); Alg. (3d); Mensur. (3d)

193—Morgans, Alfred E., 16, Bristol Trade Schoo[l], engineer—Geom. Dwg. (2d)

475—Morison, Robert, 20, Glasgow Ath., clerk—Bkpg. (2d)

1251—Morley, Thomas, 20, Chatham M.I., shipwrig[ht] (apprentice)—Arith. (1st); Conic Sec. (2[d]); Princ. Mech. (2d)

873—Mort, William, 27, Manchester M.I., book-keep[er]—Anim. Phys. (3d)

113—Mortimer, Hugh H., 16, Blackburn M.I., engin[eer]—Arith. (3d)

868—Mortimer, Thomas, 20, Manchester M.I., clerk—Bkpg. (2d)

798—Mortlock, Philip R., 21, Lond. M.I., joiner—Arith. (2d)

135—Moscrop, Robert, 45, Bolton M.I., mechanic—Princ. Mech. (3d)

38—Moss, George T., 18, Farnham Young Men's Inst., clerk—Arith. (2d); Music (2d)

76—Moss, Robert J., 19, Bessbrook Mut. I. Soc., apprentice—Geom. Dwg. (3d); Mens. (3d)

837—Moss, Walter W., 18, Manchester M.I., brick-layer—Geom. Dwg. (3d)

572—Motherwell, Robert, 19, Glasgow M.I., clerk—Bkpg. (1st)

471—Mowat, William, 16, Glasgow Ath., grocer—French (2d)

474—Muir, Matthew, 16, Glasgow Ath., manufactur[er]—Arith. (3d); Bkpg. (3d)

641—Muirhead, Andrew, 49, Leicester Ch. of Eng. Inst., staff-sergeant—Arith. (3d)

576—Muirhead, John, 37, Glasgow M.I., clerk and ex[ise] officer of customs—Eng. Hist. (2d); Geog. (3[d])

441—Mundell, William, 18, Hastings and St. Leonard[s] M.I., assistant master in nat. school—Arith. (3[d])

861—Munn, William W., 19, Manch. M.I., clerk—French (3d)

179—Munro, John, 17, Bristol Trade School, engineer—Geom. Dwg. (1st)

478—Musgrave, Philip, 22, Glasgow Ath., clerk—Geog. (1st)

638—Myers, Thomas, 27, Leeds Y. Men's Chris. Assoc., clerk—Trig. (3d)

651—Neeld, Henry, 17, Lichfield W.M. Assoc., house painter—Freehand Dwg. (2d)

228—Nelson, John, 18, Burnley M.I., cut-looker—Arith. (2d); Bkpg. (3d)

660—Nelson, Robert, 17, Liverpool Coll., clerk—Bkpg. (3d)

636—Nichols, Joseph W., 19, Leeds Y. Men's Chri[s]. Assoc., clerk—Bkpg (2d); Geog. (3d)

16—Nicol, John C., 17, Aberdeen M.I., architect['s] apprentice—Alg. (3d)

921—Niven, David C., 24, Paisley Artizans' Inst., [?] rate collector—Logic and Men. Sci. (1st)

466—Niven, George T., 17, Glasgow Ath., clerk—French (1st)

723—Noakes, Francis M, 18, City of Lond. Coll., pocket-book maker—Bkpg. (2d)
1054—Noar, William H., 22, Salford W.M. Coll., salesman—Bkpg. (2d)
391—Noble, Joseph, 21, Black Dyke Mills (Halifax) M.I., warehouseman—Mens. (2d)
784—Nops, Walter, 16, Roy. Polyt. Inst., clerk—Arith. (1st); Alg. (3d)
413—Norminton, John, 26, Halifax W.M. Coll., warehouseman—Eng. Lit. (3d)
802—Norris, William R., 17, Lond. M.I., clerk—Eng. Hist. (2d); Geog. (2d)
457—North, Wesley, 18, Hunslet M.I., mechanic—Geom. (2d); Arith. (3d); Eng. Hist. (3d); Pract. Mech. (3d)

623—Ogden, Charles B., 16, Leeds M.I.—Arith. (1st); Eng. Hist. (1st); Geog. (1st, with 2d prize); Alg. (2d)
599—Orriss, James S., 17, Ipswich W.M.C., merchant's clerk—Bkpg. (1st); Geog. (3d)
810—Osborne, William, 25, St. Stephen's (Westm.) Evg. School, gardener—Flori. (3d); Fruit and Veg. Culture (3d)
652—Owen, Samuel, 16, Lichfield W.M. Assoc., clerk to land surveyor—Free-hand Dwg. (2d)

485—Pagan, John, 22, Glasgow Ath., book-keeper—French (1st) with 1st prize
1145—Palfrey, Mark, 26, Stourbridge Assoc. Inst., clerk—Bkpg. (3d)
724—Palmer, Edward O'B., 19, City of London, Coll., clerk—French (3d)
972—Palmer, Henry, 20, Watt Inst., Portsea, shipwright (apprentice)—Conic Sec. (2d); Alg. (2d); Princ. Mech. (2d); Trig. (3d)
18—Pardy, Alexander, 23, Aberdeen M.I., clerk—Bkpg. (2d); French (2d)
579—Park, John, 24, Pop. Evg. Classes, And. Un., Glasgow, underground overs man—Min. and Met. (2d)
825—Park, William, 16, Roby Lit. and Educ. Soc., draughtsman—Mensur. (2d)
850—Parnell, George, 22, Manchester M.I., book-keeper—Bkpg. (2d); Anim. Phys. (2d)
327—Parsons, Alfred, 22, Burton Lit. Soc., gardener—Botany (3d)
255—Parry, Parton T. W., 28, Burrage-road Evg. Classes, saddler—Geom. Dwg. (2d)
143—Peacock, Charles, 21, Bradford M.I., clerk—Bkpg. (2d)
151—Pearce, Charles W., 16, Bradford M.I., engineer—Arith. (2d)
537—Peden, James, 23, Glasgow M.I., clerk—Bkpg. (2d)
1055—Pellett, Alfred, 17, Salford W.M. Coll., clerk—Bkpg. (2d)
511—Peters, William, 18, Glasgow Inst., pattern designer—Free-hd. Dwg. (3d)
767—Pethybridge, William, 20, Royal Poly. Inst., clerk—Arith. (1st); Geom. (1st) with 1st prize
14—Petty, Adolphus G., 21, Aberdeen M.I., clerk—French (3d)
962—Phillips, Thomas, 18, Pembroke Dock M.I., shipwright (apprentice)—Arith. (1st)
725—Phillips, William R., 17, City of London Coll., clerk—Bkpg. (2d)
1188—Pick, Richard, 17, Thirsk M.I., chemist—Free-hd. Dwg. (3d)
395—Pickard, Sam, 19, Halifax M.I., railway clerk—Bkpg. (3d)
209—Pidduck, Charles A., 20, Burnley M.I., ironmonger—Arith. (3d)
345—Pike, Robert H., 21, Devonport M.I., shipwright (apprentice)—Mens. (2d)
1191—Pilkington, Herbert, 24, Wakefield M.I., millwright—Arith. (3d)
934—Pinkerton, William, 21, Paisley Artizans' Inst., clerk—French (3d)
177—Plant, Walter A., 17, Bristol Trade School, farmer—Geom. Dwg. (3d)
407—Plummer, George, 18, Halifax W.M. Coll., bookseller—Arith. (2d)
727—Pollard, Henry T., 18, City of London Coll., clerk—Eng. Hist. (2d); Logic and Mental Science (2d)
663—Pollock, William, 24, Liverpool Coll., joiner—Free-hd. Dwg. (2d); Geom. Dwg. (3d)
1057—Poole, James H., 17, Salford W.M. Coll., clerk—Geog. (3d)
444—Poole, Thomas, 21, Hastings M.I., joiner—Arith. (3d.)
4—Pope, Samuel, 28, Aberdeen M.I., clerk—Freehand Dwg. (2d)
97—Porter, Ellen, 20, Birming. and Midl. Inst., daily governess—German (3d); Music (3d); French (3d)
1259—Potts, John J., 21, Newcastle-on-Tyne Ch. Inst., comm. clerk—Freehand Dwg (2d)
1178—Potts, Mark, 26, Stockport M.I., clerk—Arith. (1st)
1113—Powell, Charles, 19, Southampton Ath., clerk—Music (2d)
874—Powell, Edwin, 17, Manchester M.I., clerk—Arith. (1st)
656—Power, John 21, Litchfield W.M. Assoc., grocer's assistant—Music (2d); Arith. (3d)
229—Preston, John, 22, Burnley M.I., weaver—Arith. (3d)
63—Priestnall, Jonas, 16, Ashton-under-Lyne M.I., pupil-teacher—Arith. (1st)
578—Provand, Dixon, 18, Pop. Eng. Classes, Anderson. Univ., Glasgow, chemist—Arith. (2d); chem. (2d)
287—Pulford, William H., 16, Carlisle M.I., clerk—Arith. (2d)
1202—Purnell, William J., 19, Royal Arsenal, Woolwich, Science School, turner—Geom. Dwg. (3d)
805—Pywell, John E., 17, St. Stephens (Westm.), Ev. Schools, pupil teacher—Arith. (3d); Geog. (3d)

1206—Quick, James, 17, Science School, R. Arsenal, Woolwich, shipwright (app.)—chem. (3d)

1237—Rankeilor, W. C., 16, Stourbridge Ch. of Eng. Inst., fitter and turner—Freehand Dwg. (3d)
346—Raymond, Nicholas R., 19, Devonport M.I., engineer student—Arith. (3d)
819—Redfern, Alfred, 20, Macclesfield U. Knowl. Soc., silk weaver—Arith. (3d)
467—Relton, Richard T., 17, Glasgow Ath., clerk—French (3d)
585—Reoch, Robert, 25, Pop. Ev. Classes, Anderson. Un., Glasgow, chemist—chem. (2d)
1100—Richards, Henry, 34, Southampton Ath., in H.M.'s Customs—Music (3d)
347—Richardson, Charles S., Devonport M.I., architect's pupil—Freehand Dwg. (2d.)
866—Richardson, Henry, 18, Manchester M.I., clerk—Arith. (3d); Anm. Phys. (3d)
929—Richmond, George, jun., 17, Paisley Artizan's Inst., clerk—Arith. (3d)
729—Rigg, Thomas, 20, City of Lond. Coll., clerk—Eng. Hist (1st) with 2d. prize; Geog. (1st) with 1st. prize; Arith. (2d)
980—Riley, Calverley R., 22, New Swindon M.I., railway clerk—Pract. Mech. (2d); Mens. (2d); Geom. Dwg. (3d)
369—Riley, Thomas, 19, Droylsden Educ. Inst., warehouseman—Geom. Dwg. (3d)
925—Risk, Robert, 27, Paisley Artizans' Inst., coal agent—Bkpg. (2d)
621—Roberts, Charles, 18, Leeds M.I., clerk—Arith. (3d)

1058—Roberts, Daniel, 19, Salford W.M. Coll., letter-press printer—Arith. (3d)
99—Roberts, Thomas, 22, Birm. and Midl. Inst., chemist—Chem. (2d)
168—Roberts, William H., 19, Bradford M.I., in grey room—Arith. (3d); Geog. (3d)
604—Roberts, William P., 26, Ipswich W.M. Coll., gardener—Fruit and Vegetable Culture (1st), with 1st prize; Floriculture (2d)
406—Robertshaw, Thomas, 22, Halifax W.M. Coll., carpet weaver—Bkpg. (2d)
1196—Robinson, Hartley, 23, Wilsden M.I., powerloom weaver—Geog. (3d)
314—Robinson, John, 18, Crewe M.I., fitter—Arith. (3d)
1060—Robinson, Robert H., 21, Salford W.M. Coll., clerk—Bkpg. (2d)
1248—Robinson, Ninian J., 18, People's Lit. Inst., Belfast, apprentice in linen warehouse—Arith. (2d)
310—Robinson, Thomas, 18, Clitheroe M.I., weaver—Arith. (3d)
635—Robinson, Walter J., 28, Leeds Y.M. Christian Assoc., mechanic—Pract. Mech. (1st) with 1st prize
100—Rock, Rose Septima, 18, Birm. and Midl. Inst.—German (2d)
472—Rodman, Robert, 21, Glasgow Ath., clerk—Latin, &c. (2d)
882—Rogers, John, 19, Manchester M.I., librarian—Geom. Dwg. (3d)
532—Rogers, Josiah, jun., 17, Glasgow M.I., stationer—Bkpg. (2d)
24—Ronald, William, 24, Aberdeen M.I., clerk—French (2d)
854—Rose, Joseph R., 17, Manchester M.I., stock-keeper—Bkpg. (2d)
17—Ross, Alexander M., 18, Aberdeen M.I.. railway clerk—French (2d)
583—Ross, George, 31, Pop. Evg. Classes, And. Un., Glasgow, tailor—Anim. Phys. (3d)
612—Rossiter, William H., 21, Leeds M.I., chemist assistant—Chem. (2d)
436—Rostron, Edward, C., 18, Haslingden M.I., weaver—Geog. (3d)
274—Rothwell, James, 20, Bury Ath., block cutter—Freehand Dwg. (3d)
272—Rothwell, John, 18, Bury Ath., book-keeper—Freehand Dwg. (3d)
895—Rowland, Samuel, 18, Manch. M.I., book-keeper—Bkpg. (2d)
875—Rowland, Thomas, 23, Manch. M.I., clerk—Bkpg. (2d)
996—Roydes, James, 20, School of Sci. and Art, Oldham, Lyceum, book-keeper—Mensur. (2d); Geom. Dwg. (3d)
258—Russell, Alfred H., 21, Burrage-road Evg. Classes, fitter—Geom. Dwg. (3d)
544—Russell, William, 18, Glasgow M.I., clerk—Arith. (2d); Bkpg. (3d)
730—Ryan, Andrew J., City of London Coll., clerk—Geog. (3d)
101—Rylatt, Mary Alice, 17, Birm. and Midl. Inst., governess—French (3d)

1217—Sadler, Robert W., 21, Science School, R. Arsenal, Woolwich, iron-turner—Geom. Dwg. (2d)
211—Sagar, Elijah, 21, Burnley M.I., book-keeper—Arith. (1st)
876—Sanderson, John G., 19, Manch. M.I., engineer and millwright—Geom. Dwg. (3d)
77—Sands, Thomas, 24, Bessbrook M. Imp. Soc., clerk—Arith. (1st); Anim. Phys. (3d)
1076—Sargeant, John, 21, Slough M.I., carpenter—Arith. (3d); Free-hd. Dwg. (3d); Mensur. (3d)
731—Sarll, Andrew, 27, City of London Coll., assist.-teacher—Bkpg. (1st); Arith. (3d)
102—Savatard, Louis, 18, Birm. and Midl. Inst., tutor—Arith. (3d)
601—Saxton, William, 19, Liverpool Coll., clerk—Freehand Dwg. (2d); Arith. (3d)
856—Scholes, Thomas, 22, Manchester M.I., time-keeper—Geom. Dwg. (3d)
348—Sennett, Richard, 18, Devonport M.I., engineer student—Alg. (1st); Mens. (2d)
614—Severs, Joseph, 20, Leeds M.I., chemist and druggist—Chem. (3d)
1069—Shackleton, Charles H., 17, Salford W.M. Coll., clerk—Bkpg. (2d)
1165—Shann, George V. 19, Tettenhall (Willenhall Loc. Board), carrier's clerk—Italian (2d); French (2d)
10—Sherret, David, 20, Aberdeen M.I., engineer—Geom. Dwg. (3d)
413—Shield, Thomas, J., 16, Haley-hill W. Men's Coll. (Halifax), jun. clerk—Arith. (1st); Alg. (3d)
1062—Shorrocks, James H., 18, Salford W.M. Coll., clerk—Arith (1st); Geog. (1st); French (2d)
167—Silverwood, Leonard, 17, Bradford M.I., book-keeper—Geog. (3d)
732—Simmons, John D., 31, City of Lond. Coll., oil and colourman—German (2d; French (3d)
104—Simpkin, Samuel J., 17, Birm. and Midl. Inst., pupil teacher, Geog. (3d)
282—Simpson, Benjamin H., 16, Carlisle M.I., civil engineer—Geom. (2d); Arith. (3d)
785*—Simpson, James F., 20, West Lond. Youths' Inst., music publisher's assistant—Music (1st)
103—Simpson, John, 25, Birm. and Midl. Inst., certificated teacher—French (3d)
938—Slater, James, 26, Paisley Artizans' Inst., smith—Music (1st)
239—Slater, William, 20, Burnley Ch. of Eng. Lit. Inst., engineer apprentice—Arith. (3d)
174—Smiddy, John E., 16, Bradford M.I., in a stuff warehouse—Geog. (3d)
1116—Smith, Benjamin, 25' Dudley M.I., colliery clerk—Music (1st); Mensur. (2d); French (3d)
325—Smith, Charles H., 18, Derby M.I., ironmaster's clerk—Arith. (1st); Bkpg. (1st)
760—Smith, George A., 22, Roy. Polyt. Loc. Bd., clerk—Arith. (1st) with 1st prize; Bkpg. (1st) with 1st prize; Alg. (1st) with 2d prize; Geom. (1st) with 2d prize
249—Smith, Henry H., 19, Burrage-road Ev. Classes, turner and fitter—Geom. Dwg. (3d)
146—Smith, James, 20, Bradford M.I., railway clerk—Arith. (1st)
171—Smith, James, 20, Bradford M.I., clerk—Eng. Hist. (3d); Pol. and Soc. Econ. (3d)
69—Smith, James H., 23, Bacup M.I., weaver—Arith. (2d)
733—Smith, James Rigby, 25, City of Lond. Coll., clerk—Dom. Econ. (1st); Trigon. (2d); Mens. (2d) together with the Prince Consort's prize of twenty-five guineas
194—Smith, John, 21, Bristol Trade School, railway clerk—Chem. (1st)
366—Smith, John, 23, Droylsden Educ. Inst., book-keeper—Geog. (2d)
1137—Smith, Joseph, 17, Messrs. Chances' Library, glass painter—Free-hand Dwg. (2d)
794—Smith, Martha, 20, Lond. M.I.—Geog. (1st); Eng. Hist. (3d)
349—Smith, Robert, 18, Plymouth M.I., photographer's assistant—Arith. (1st); Music (1st) with 2nd prize.
1088—Smith, Thomas, 26, Southampton Ath., out-door officer H.M. Customs—Arith. (3d)
1200—Smith, William R., 16, Sci. Sch., R. Arsenal Woolwich, labourer—Chem. (2d)
1081—Snowball, William, 20, Slough M.I., carpenter—Geom. Dwg. (3d)
1108—Sparks, John, 18, Southampton Ath., clerk—Bkpg. (2d); Geom. (2d); Alg. (3d)

421—Speak, William, 17, Halifax W.M. Coll., clerk—Arith. (3d)
584—Speir, Robert, 26, Pop. Evg. Classes, And. Un., Glasgow, chemist—Chem. (2d)
394—Spencer, Blakey, 21, Halifax, M.I., woolsorter—Bkpg. (3d)
393—Spencer, Edmund, 19, Halifax M.I., bookbinder—Bkpg. (2d)
237—Spencer, Robert, 22, Burnley Ch. of Eng. Lit. Inst., gardener—Chem. (3d); Anim. Phys. (3d); Geog. (3d)
734—Spiers, William, 19, City of Lond. Coll., clerk—Geog. (1st)
350—Stanbury, William, 18, Devonport M.I., accountant—Eng. Hist. (3d)
1164—Stanier, William H., 16, Wolverhampton Ath., railway clerk—Arith. (1st) with 2d prize; Alg. (1st); Mens. (2d)
147—Stansfield, James B., 19, Bradford M.I., warehouseman—Arith. (3d); Music (3d)
1063—Stansfield, Thomas C., 19, Salford W.M. Coll., stationer—Bkpg. (2d)
649—Stanton, Charles E., 16, Lichfield W.M. Assoc., student—French (3d)
1082—Stanton, George, 25, Slough M.I., gardener—Flori. (1st) with 1st prize; Fruit and Veg. Culture (2d)
468—Steel, Alexander F., 17, Glasgow Ath., clerk—French (2d)
492—Steel, James B., 34, Glasgow Ath., com. traveller Bkpg. (2d)
594—Steel, William, 18, Pop. Evg. Classes, And. Un., Glasgow, baker—Chem. (2d)
434—Stevenson, Henry, 22, Haslingden M.I., weaver—Geog. (2d)
1153—Stevenson, Charles A., 21, Wolverhampton, compositor—Music (1st)
555—Stevenson, James, 17, Glasgow M.I., clerk—Eng. Lit. (2d)
747—Stewart, Charles G., 16, Royal Polyt. Inst., chemist—Chem. (2d); Elect. and Magn. (3d)
501—Stewart, Elizabeth M'L., 17, Glasgow Inst.—Bkpg. (3d); Latin and Rom. Hist. (2d)
70—Stewart, Robert, 20, Bacup M.I., assistant-master—Alg. (3d); Geog. (3d)
285—Stoker, Thomas, 17, Carlisle M.I., clerk—Arith. (3d)
1229—Stone, James E., 24, Kidderminster, Ch. of Eng. Inst., clerk—Bkpg. (1st); Arith. (2d)
2—Strahan, James, 20, Aberdeen M.I., druggist—Arith. (3d); Chem. (3d)
9—Strachan, John, 18, Aberdeen M.I., engineer—Arith. (2d); Alg. (2d)
664—Stuart, Alexander B., 27, Liverpool Coll., clerk—Bkpg. (3d)
1174—Stubbs, John, 17, Staleybridge M.I., pupil teacher—Geog. (3d)
790—Styles, Alice C., 22, Lond. M.I.—Arith. (3d); Eng. Hist. (3d)
781—Summers, Thomas, 16, Roy. Polyt. Inst., pupil teacher—Elect. and Mag. (3d)
226—Sumner, Henry, 25, Burnley M.I., weaver—Bkpg. (3d)
74—Sutcliffe, George W., 17, Bacup M.I., weaver—Arith. (2d)
634—Sutcliffe, John W., 18, Leeds Y. M. Christian Assoc., clerk—Bkpg. (3d)
159—Sutcliffe, Thompson, 19, Bradford M.I., clerk—French (3d)
811—Sutherland, John, 38, St. Stephen's (Westm.) Evg. Sch., Serjeant Met. Pol.—Geog. (2d)
596—Swales, Samuel, 22, Ipswich W.M. Coll., carpenter and joiner—Bkpg. (2d)
460—Swire, William, 21, Freetown (Glossop) W.M.I., clogger—Arith. (3d)
735—Symonds, Charles D., 18, City of Lond. Coll., clerk—French (1st), with 2d prize.

180—Tabrett, Henry, 16, Bristol Trade School, fitter—Geom. Dwg. (2d)
180—Tabrett, John W., 16, Bristol Trade School, carriage-body maker—Geom. Dwg. (3d)
116—Talbot, John, 17, Blackburn M.I., clerk—Arith. (3d)
164—Tankard, Samuel, 19, Bradford M.I., in a worsted spinner's office—Arith. (3d)
187—Tarrant, Thomas, 16, Bristol Trade School, clerk—Geom. Dwg. (3d)
1115—Tart, John B., 26, Bilston Inst., grocer's assistant—Bkpg. (2d); Arith. (3d)
659—Tate, Walter, 20, Liverpool Coll., clerk—Eng. Hist. (2d); Eng. Lit. (2d)
216—Tattersall, James, 16, Burnley M.I., book-keeper—Bkpg. (3d)
204—Tavener, Joseph, 18, Bristol Trade and Min. Sch., assistant—Chem. (2d)
878—Taylor, James, 17, Manchester M.I.—Eng. Hist. (1st)
983—Taylor, James, 17, Oldham Lyceum Sch. of Sci. and Art, mechanic—Pract. Mech. (2d); Princ. Mech. (3d); Arith. (3d)
136—Taylor, John, 21, Bolton M.I., warehouseman—Free-hd. Dwg. (3d)
352—Taylor, John A., 17, Devonport M.I., grocer—Bkpg. (2d); Arith. (3d); Anim. Phys. (3d)
517—Taylor, Robert, 26, Glasgow M.I., foreman in saw mill—Arith. (2d)
908—Taylor, Thomas, 17, Middlesbro' M.I., clerk—Bkpg. (2d)
916—Taylor, William, 19, Mossley M.I., warehouseman—Bkpg. (2d)
909—Telford, Robert, 17, Middlesbro' M.I., clerk—Arith. (3d); Bkpg. (3d)
419—Tempest, Joseph, 18, Halifax W.M. Coll., pupil teacher—Arith. (1st)
915—Tetlow, Aaron, 46, Mossley M.I., warehouseman Bkpg. (2d)
736—Thacker, George, 22, City of London Coll., clerk and warehouseman—Arith. (3d)
756—Thomas, William H., 24, Royal Poly. Inst., clerk—French (3d)
1187—Thompson, Alfred, 18, Thirsk M.I., farmer—Arith. (3d); Geog. (3d)
214—Thompson, James, 24, Burnley M.I., bookkeeper—Music (1st)
1064—Thompson, John, 19, Salford W.M. Coll., clerk—Bkpg. (2d)
281—Thompson, Joseph J., 17, Carlisle M.I., at school—Arith. (3d)
*33—Thompson, William, 18, Acomb Lit. Inst., clerk—Arith. (3d)
521—Thompson, Joseph, 18, Glasgow M.I., shipwright (apprentice)—Arith. (2d)
587—Thompson, William, 16, Pop. Evg. Classes, Anders. Univ., Glasgow, chemist—Chem. (2d)
219—Thornber, Thomas, 19, Burnley M.I., warehouseman—Bkpg. (1st)
270—Thornton, Thomas, 20, Bury Ath., joiner—Geom. Dwg. (2d); Free-hd. Dwg. (3d)
1175—Thorpe, William T., 21, Staleybridge M.I., warehouseman—Bkpg. (3d)
43—Tily, Lewis, 21, Farnham Y.M. Christian Assoc., ironmonger's clerk—Music (2d)
284—Todd, Garnett, 20, Carlisle M.I., clog maker—Arith. (2d)
620—Todd, William, 19, Leeds M.I., woollen manufacturer—French (3d)
*38—Tomlinson, George, 16, Aldershot—Geog. (2d); Arith. (3d)
818—Tomlinson, Thomas D., 19, Crewe M.I., apprentice fitter—Mensur. (3d)
737—Tongue, Robert H., 16, City of Lond. Coll., clerk—Bookpg. (3d)
1072—Towers, John, 20, Salford W. M. Coll., clerk—Bookpg. (2d)

128—Townson, William, 21, Bolton M.I., joiner—chem. (2d)
353—Treleaven, Joseph T., 21, Devonport M.I., shipwright—Geom. Dwg. (2d); Bkpg. (2d)
1265—Tritton, John D., 17, Faversham Inst., blockmaker—Arith. (2d); Eng. Hist. (2d)
796—Truelove, Maurice H., 16, London M.I., bookseller's assistant—Eng. Lit. (1st)
1268—Turner, Albert, 25, Lambeth Evg. Classes, clerk—Arith. (3d); Geog. (3d)
106—Turner, James, 29, Birm. and Midl. Inst., saddler—French (3d)
107—Twist, Elizabeth, 22, Birm. and Midl. Inst., teacher—French (3d)

738—Vaughan, William, 25, City of Lond. Coll., clerk—Geom. Dwg. (1st); Logic (1st) with 1st prize
324—Veale, James, 38, Derby W. Men's Assoc., schoolmaster—Arith. (3d); Bkpg. (3d)
1125—Vickrage, William H., 17, Woodside and Hart's-hill Y. M. Mut. Imp. Inst., pupil teacher—Arith. (2d); Freehand Dwg. (2d); Geog. (2d); Bkpg. (3d)
1110—Vokes, Thomas B, 21, Southampton Ath., clerk in Ordnance Survey office—Geog. (1st); Eng. Hist. (2d)

487—Waddell, Alexander, 24, Glasgow Ath. bookkeeper—French (2d)
318—Wade, Isaac, 16, Crewe M.I., jun. clerk—Arith. (2d) Bkpg. (2d)
479—Wade, James, 29, Glasgow Ath., cashier—Polit. Econ. (1st) with 1st prize; Logic, &c. (1st) with 2d prize; Light and Heat (2d)
354—Waghorn, John W. W., 17, Devonport M.I., naval engineer (student)—German (2d); Latin, &c. (2d)
1004—Walbank, John, 25, School of Science and Art, Oldham Lyceum, mechanic—Geom. Dwg. (3d)
566—Walker, Adam, 20, Glasgow M.I., clerk—Bkpg. (1st)
*121—Walker, John, 20, Blackburn M.I., clerk—Eng. Lit. (3d)
807—Walker, John W., 16, St. Stephen's, Westminster Evg. School, pupil teacher—Geog. (3d)
1258—Walker, Sarah E., 17, Newcastle-on-Tyne Ch. of Eng. Inst., pupil teacher—Free-hd. Dwg. (1st)
884—Walker, William, 26, Manchester M.I., clerk—Bkpg. (1st); Arith. (3d)
137—Walwork, William, 18, Bolton M.I., brass-finisher—Free-hd. Dwg. (3d)
355—Walter, Elijah, 23, Devonport M.I., writer—Arith. (2d); Bkpg. (2d)
242—Walton, Robert, 22, Burnley Ch. of Eng. Lit. Inst., weaver—Dom. Econ. (1st) with 2d prize; Anim. Phys. (1st) with 2d prize
842—Warburton, Alfred, 16, Manch. M.I., clerk—Arith. (1st); Bkpg. (2d)
862—Warburton, Joshua, 19, Manch. M.I., clerk—Bkpg. (3d)
298—Ward, Charles W., 19, Christchurch W.M. Inst., tailor—Arith. (2d)
607—Ward, Francis C., 16, Ipswich W.M.C., surveyor's clerk—Bkpg. (2d); Arith. (3d)
865—Ward, George M., Manch. M.I., clerk—Arith. (2d)
148—Ward, Sampson, 23, Bradford M.I., woolsorter—Bkpg. (3d)
1172—Wardle, William, 16, Staleybridge M.I., pupil teacher—Geog. (3d)
1008—Wareing, William, 22, Oldham Lyceum, spindle maker—Bkpg. (2d)
918—Waterhouse, Joseph, 20, Mossley M.I., woollen weaver—Bkpg. (2d)
109—Watson, Charles J., 18, Birm. and Midl. Inst., grocer—French (3d)
495—Watson, John, 16, Glasgow Inst., law clerk—Bkpg. (3d)
1078—Watson, Joseph, 22, Slough M.I., clerk—Arith. (3d); Freehand Dwg. (3d)
170—Watson, Thomas B., 19, Bradford M.I., accountant—Chem. (3d); Anim. Phys. (3d)
765—Watson, William G., 27, Roy. Polyt. Inst., cashier—Bkpg. (2d)
880—Wealthall, Thomas, 21, Manch. M.I., dentist—Anim. Phys. (3d)
195—Welsh, James, 28, Bristol Trade School, teacher—Chem. (2d)
739—Wentzell, George R., 21, City of Lond. Coll., stationer's assistant—French (3d)
*975—Wharmby, James, 19, New-mills W.M.I., bookkeeper—Arith. (3d)
438—Whitaker, James, 19, Haslingden M.I., bookkeeper—Arith. (2d); Anim. Phys. (3d)
762—White, Andrew T., 18, Roy. Polyt. Inst., upholsterer—Bkpg. (2d)
357—White, Henry G., 24, Devonport M.I., shipwright—Dom. Econ. (1st), with 1st prize; Mens. (1st); Trigon. (2d); Anim. Phys. (3d)
330—White, Philip R., 32, Derby W. Men's Assoc., schoolmaster—Bkpg. (2d); Arith. (3d)
1148—Whitehead, Elihu T., 18, Walsall Church Inst., chemist and druggist—Chem. (2d)
881—Whitehead, William H., 21, Manch. M.I., warehouseman—Arith. (3d)
645—Whitehouse, William H., 20, Lichfield W.M. Assoc., colliery clerk—Music (2d)
628—Whitmell, Charles T., 16, Leeds M.I.—Chem. (2d)
552—Whitson, Alexander, jun., 21, Glasgow M.I., cashier—German (2d); French (3d)
985—Whittaker, Joseph, 25, Oldham Lyceum Sch. of Sci. and Art, joiner and carpenter—Geom. Dwg. (3d)
1065—Whittaker, Walter, 18, Salford W.M. Coll., invoice clerk—Bkpg. (2d)
919—Whitworth, Robert, 21, Mossley M.I., piecer—Bkpg. (2d)
246—Wignall, John W., 17, Burnley Ch. of Eng. Lit. Inst., watchmaker—Arith. (3d); Mens. (3d)
619—Wildman, William P., 17, Leeds M.I., mechanic—Geom. (3d)
173—Wilkinson, Swaine, 24, Bradford M.I., warehouseman—Eng. Hist. (2d)
210—Wilkinson, William C., 22, Burnley M.I., bookkeeper—Arith. (2d); Bkpg. (3d)
1155—Williams, John, 16, Wolverhampton Ath., whitesmith—Arith. (1st)
1096—Williams, William H., 22, Southampton Ath., carpenter—Music (3d)
740—Willmott, George, 19, City of Lond. Coll., telegraph operator—Bkpg. (2d)
981—Willmott, Robert, 22, New Swindon M.I., engine fitter—Pract. Mech. (3d); Mensur. (3d)
463—Wilson, Archibald H., 19, Glasgow Ath., com. clerk—French (2d)
1001—Wilson, Armstrong, 36, Oldham Lyceum, schoolmaster—Music (3d)
420—Wilson, Clarke, 20, Halifax W.M. Coll., brushmaker—Arith. (1st); Eng. Lit. (2d)
741—Wilson, John H., 24, City of Lond. Coll., chemist and druggist's assistant—Chem. (3d)
783—Wilson, Thomas, 24, Roy. Polyt. Local Bd., clerk Bkpg. (3d)
1220—Windass John, 23, York Inst., painter—Geom. Dwg. (2d); Free-hand Dwg. (2d)
451—Winch, John, 46, Hull Y. People's Inst., painter and gilder—Music (3d)
644—Windsor, Henry R., 16, Lichfield W.M. Assoc., chorister—Bkpg. (2d); Arith. (3d)
496—Wishart, Andrew M., 20, Glasgow Inst., letter-carrier, G.P.O.—Bkpg. (2d)
742—Witcomb, Walter, 20, City of Lond. Coll., clerk Arith. (3d)
165—Wolstencroft, W., 18, Bradford M.I., clerk—Arith. (3d)

442—Womersley, Frederick W., 26, Hastings M.I., upholsterer—Arith. (1st); Alg. (3d)

490—Wood, Robert, 17, Glasgow Ath., clerk—French (3d)

886—Wood, Thomas, 19, Manchester M.I., warehouseman—Bkpg. (1st)

1239—Woodhouse, Thomas J., 19, Stourbridge Ch. of Eng. Inst., in civil service (proposed)—Arith. (3d)

896—Wolfenden, Richard H., Manchester M.I., clerk—Arith. (3d)

110—Woolley, Jane E., Birm. and Midl. Inst., assistant governess—Arith. (3d); Eng. Hist. (3d)

1012—Woodrow, George M., 20, Richmond Parochial Library, gardener—Floriculture (1st) with 2nd prize; Fruit and Vegetable culture (1st) with 2d prize; Botany (3d) with R. Horticultural Society's prize of £3; Bkpg. (3d)

772—Wordley, Ann, 16, Roy. Polyt. Inst.—French (3d)

56—Worger, George, 30, S.E.R. M.I., bricklayer—Arith. (3d)

924—Wotherspoon, John B., 20, Paisley Artizans' Inst., clerk—Bkpg. (2d)

1006—Wright, John T., 21, Werneth M.I., book-keeper—Mens. (1st), with 1st prize.

547—Wyld, J. Paton, 17, Glasgow M.I., marine engineer—French (3d)

465—Yarborough, John D. C., 17, Glasgow Ath., clerk French (2d)

1117—Young, Hannah E., 27, Dudley M.I., private schoolmistress—Arith. (1st)

1194—Young, Ralph H., 18, West Hartlepool M.I., articled clerk (law)—Algebra (3d)

513—Young, William, 20, Glasgow M.I., clerk—Freehand Dwg. (3d)

540—Young, William, 17, Glasgow M.I., proposed Ph. D.—Chem. (2d)

PARIS UNIVERSAL EXHIBITION, 1867.

Meetings of the intending metropolitan exhibitors in classes 18, 20, 29, 30, 33, 34 and 40, have taken place at the Society's house during the past week, and sub-committees have been appointed for the allotment of space amongst the claimants in each class.

Fine Arts.

Paris Annual Exhibition of Works of Art.—The doors of this exhibition have been closed, according to custom, for four days, in order to make certain changes in the disposition of the pictures, and to mark the works for which medals have been awarded. The doors will now remain open until the 20th instant. In the meantime the list of awards have been published, and includes amongst others the name of M. Robert-Fleury, jun., whose picture, "Warsaw in 1861," was named especially in the notice of the exhibition which appeared in the *Journal* of the 18th of May; the painters of the other works there named are, we believe, *hors concours*—that is to say, they have already received three medals. The son of Meissonier is also among the medallists. The first ballot for the award of the two medals of honour has taken place without any result. Of the 506 artists entitled to vote 197 exercised the privilege, and of these 39 deposited blank papers, which means that in the opinion of the voters no artist was worthy of one of the greater prizes; the highest number of votes given in favour of an exhibitor was 28. As in no case was a majority obtained, the vote has to be taken again, and, if necessary, a third time. The ten artists who obtained the largest number of votes are as follows:—Bonnat, Carpeaux (sculptor), Emile Lévy, Auguste Bonheur, T. Robert-Fleury (mentioned above), Corot and Fromentin (the well-known landscape painters), Edouard Dubufe, Gumery (sculptor), and Gérôme. The second ballot is on this list, and should that not be decisive the third will be for choice of two out of the three highest in the second trial. The working of liberal arrangements such as this voting of the medals of honour by the whole body of medalled and exhibiting artists is highly interesting and instructive as a study. It has been said that only 197, out of a body of 506, recorded their votes, but it must be remembered that to do so each was obliged to attend personally at the exhibition building in the day-time, when the hours are precious to an artist; besides, very many artists live at great distances from the centre of Paris, and not a few at Versailles, Fontainebleau, and even more distant places; perhaps, therefore, the attendance of very nearly two-fifths of the whole entitled to vote was as much as could be fairly expected. As regards the result of the first ballot, it may be said that, with very few exceptions only, the artists placed at the head of the poll would, doubtless, have been in the same position, or nearly so, had the voters belonged to any other section of the artistic or critical world; there are, however, two or three names low down in the list, whose position is not in accordance with the opinion of a large section of the art-world of Paris.

Notes.

Rendering Nitroglycerine Non-Explosive.—The *Mining Journal* states that, practically, there is no greater difficulty in rendering nitroglycerine non-explosive and explosive at pleasure, than there is in accomplishing the same feat with gunpowder, although the means employed are, of course, dissimilar. The recent accidents with the new explosive agents have induced Mr. Nobel to turn his attention seriously to the subject, and he is now enabled to state that by mixing the nitroglycerine with methylic alcohol, a cheap spirit, popularly known as spirit of wood, the nitroglycerine is rendered unexplosive, either by percussion or heat. When required for use water is added, which absorbs the spirit, and the oil sinks to the bottom of the vessel, whence it is drawn by a syphon, and its explosive nature thereupon found to be restored. Experiments for testing the value of this discovery are said to have already been made in America with satisfactory results. The subject is one of the greatest importance to miners.

Tunnel between England and France.—M. Thomé de Gamond proposes the construction of a submarine railway across the channel, and to form four tunnels for this purpose. He has given up his original scheme of forming artificial islands for protecting the air-shafts as too expensive. It is said that the attempt to construct this railway will really be made; surveys are actually making at Boulogne, and the plans in relief will be shown at the Paris exhibition next year.

Correspondence.

Iron Oxide Paint.—Sir,—In the last number of the *Journal* mention is made of "oxide of iron paint." Allow me to observe that my firm (Blundell, Spence, and Co.) has for upwards of a quarter of a century manufactured oxide of iron paint, and recommended it for the purpose of protecting iron and other materials. No doubt, if engineers and iron ship-builders were as well versed in chemistry as they are in mechanics, oxide of iron paint would be much more extensively used for protecting iron than it has hitherto been.—I am, &c., G. D. Longstaff.

Anchor Wharf, 9, Upper Thames-street,
June 4th, 1866.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Geographical, 8½.
Tues. ...Medical and Chirurgical, 8½.
Zoological, 8½.
Syro-Egyptian, 7½. Dr. Samuel Birch, "An account of the recently-discovered Trilingual Tablet of Tanis."
Photographic, 8.
Ethnological, 8. Mr. John Crawfurd, "On Cæsar's account of Britain and its Inhabitants in reference to Ethnology."
Wed. ...Microscopical, 8. Mr. R. Beck, "On the function of some peculiar vibrating hairs on spiders and insects."
Literary Fund, 3.
Society of Arts, 8½. Conversazione.
Archæological Assoc., 8½.
Thur. ...Royal, 8½.
Antiquaries, 8½.
R. Society Club, 6.
Fri ......Philological, 8.
Royal Inst., 8. Prof. Tyndall, F.R.S., "Experiments on the Vibrations of Strings."
R. United Service Inst., 3. Commander R. A. E. Scott, R.N., "Modern Carriages for heavy Naval Ordnance;" to be followed by a Discussion.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 30th May*, 1866.

274. Galway Town Election—Minutes of Evidence.
287. Population (England, Wales, and Scotland)—Return.
292. Quebec Fortifications—Return.
296. Electoral Statistics (Wales)—Return.
297. Redistribution of Seats Bill—Return.
Chili and Spain—Correspondence respecting the War.

Delivered on 31st May, 1866.

136. Bills—Curragh of Kildare (corrected Copy).
165. " Glebe Lands (Scotland) (amended).
68 (iv). Trade and Navigation Accounts (30th April, 1866).
160 (iii). Election Expenses—Return (Part IV. Cities and Boroughs)—continued.
290. Terminable Annuities—Returns.
295. Boroughs (Wales)—Return.
297. Redistribution of Seats Bill—Returns (corrected Copy).
299. Habeas Corpus Suspension (Ireland) Act (Limerick Gaol)—Return.
305. Fortifications—Account.
306. General Committee of Elections—Mr. Speaker's Warrant.

Delivered on 1st June, 1866.

101. Bills—Elective Franchise (corrected Copy).
167. " Marriages (Sydmonton).
178. " Pier and Harbour Orders Confirmation (No. 2).
243. Huddersfield Election—Minutes of Evidence.
270. London (City) Corporation Gas, &c. Bills—Report and Evidence.

Delivered on 2nd June, 1866.

69 (iv). Railway and Canal Bills—Fifth Report.
276. Justices' Clerks—Return.
278. Navy (Ship "Octavia")—Surgeon's Report.
286. Record Commission (Ireland)—Return.
288. Navy (Iron Ballast)—Return.
313. Electric Light—Correspondence.

Delivered on 4th June, 1866.

166. Bills—Standard of Weights, Measures, and Coinage.
169. " Oyster Fisheries.
171. " General Police and Improvement (Scotland) Act (1862) Amendment.
237. Electoral Divisions (Ireland)—Returns.
279. Occupiers—Return.
300. Valuations (Ireland)—Returns.
312. Vessels Registered—Return.
314. Burghs (Scotland)—Return.
303. Tay River—Return.

Delivered on 5th June, 1866.

172. Bills—Attorneys and Solicitors (Ireland).
173. " Vaccination (as amended by Select Committee).
226. East India (Deccan)—Return.
273. East India (Home Accounts).
311. Diseased Cattle.
310. Cattle Diseases (Ireland) Act.
Constabulary (Ireland)—Report of Commissioners.
Colonial Bishoprics—Correspondence (No. 1.)
Manufactures, Commerce, &c.—Reports of Secretaries of Embassy, &c. (No. 14.)

Patents.

From Commissioners of Patents' Journal, June 1st.

Grants of Provisional Protection.

Albumen, decolorizing—1214—A. Bernard.
Boats, fixing row-locks to—1262—F. Furrell.
Boats, propelling—1284—C. E. Brooman.
Breech-loading fire-arms, extracting cartridge cases from—130—J. Cole and G. S. Melland.
Candles—1388—F. Field.
Candlesticks—1344—J. L. Rickards.
Carriages, bearing springs for—725—B. Hadley.
Casks and taps—1368—W. Dennis.
Casks, closing the tap holes of—1203—T. Hutton.
Cordage—1318—G. T. Bousfield.
Digging machinery—772—O. C. Evans.
Door handles, securing—1366—J. Craig.
Dry gas meters—1382—W. Payton.
Embankments from corrosion, preserving—1326—W. E. Gedge.
Fibrous materials, preparing—1272—J. Banty and F. North.
Fluids, elevating and forcing—1346—J. Bernard.
Fuel, combustion of—1365—A. P. Price.
Grain, mills for grinding—1238—J. Morris.
Gravel walks, raking—1371—J. Webster.
Green colouring matters, obtaining—1390—R. Holliday.
Lamps—1394—W. Clark.
Leaves, turning over—1336—G. and E. Ashworth.
Leech vases, a perforated cage for—192—J. B. Shillcock.
Life at sea, saving—1398—C. Aggio, F. Cotti, and N. Ferraris.
Liquids and fluids, heating—1158—A. A. L. P. Cochaux.
Machinery, cleaning—1034—T. K. Whitehead.
Machinery, regulating the speed of—1369—R. B. Pope.
Photographic prints, producing—1364—W. H., F., and E. Southwell.
Plastic substances—1369—W. Curry.
Railway signals—524—J. A. Warwick.
Railways, permanent ways of—635—W. Rogers.
Relief or intaglio, producing surfaces in—1334—D. C. Dallas.
Sheet metal, hammering—1362—W., J., and H. Harrison.
Ships' boats, raising and lowering—1347—T. Thornton.
Ships, propelling—1216—W. J. Murphy.
Stands—1285—T. D. Rock.
Steam boilers—1200—D. Thomson.
Steam engines and boilers—1212—J. C. Pearce.
Steam, increasing the expansive power of—1184—J. Taylor.
Steam tilling implements, working—1192—J. Howard & E. T. Bousfield.
Stereotype plates, moulds for—1186—M. Nelson.
Substances, treating—1160—J. W. Burton.
Surfaces, applying materials to—1150—H. D. Plimsoll.
Surfaces for printing, obtaining—1380—J. Chesterton.
Telegraphic cables, winding in—1218—F. Jenkin.
Tobacco, pipes for smoking—1088—G. White.
Tubes, &c., sinking—995—T. Scott.
Umbrellas and parasols—1370—R. Fyers.
Vegetables, pickling—1254—H. A. Manfield.
Vehicles—1250—R. Brierley.
Waggon covers, coating—1316—W. McIlwraith.
Water pressure regulators—1329—J. Sheldon.
Windows—1392—G. A. Elliott.

Inventions with Complete Specifications Filed.

Bread, ovens for baking—1472—H. A. Bonneville.
Casks, metal hoops for—1449—G. Haseltine.
Draft and spray wheel, a—1492—J. D. Whelpley and J. J. Storer.

Patents Sealed.

3103. J. S. Templeton.
3105. D. Hall.
3112. J. Steart.
3116. J. J. Ashworth.
3119. A. S. Brooman.
3128. E. Vagg.
3138. G. Daws.
3142. A. C. Bamlett.
3147. W. Grosvenor.
3152. J. Woollatt.
3153. P. de Monteeir, P. Lehaitre, and A. Jullienne.
3154. N. J. Holmes.
3174. A. S. Brooman.
3183. E. Morewood.
30. T. E. Vickers.
115. N. W. Wheeler.
351. A. Mahieux.
394. H. E. F. de Briou.
775. M. Morse.
875. G. T. Bousfield.
951. W. E. Newton.

From Commissioners of Patents' Journal, June 5th.

Patents Sealed.

3148. C. D. Hitchcock and J. Shimmon.
3150. G. F. Russell.
3157. W. Calvert and J. S. Robertson.
3161. G. Walles and B. Cooper.
3166. E. Watteau.
3170. W. Jackson.
3173. A. Doull.
3179. A. Barclay.
3188. W. W. Hulse.
3194. J. Goddard.
3245. W. A. West.
3315. W. Jackson.
415. E. Seyd.
554. C. J. Cannon.
964. W. E. Newton.
1001. A. V. Newton.
1121. G. Haseltine.

Patents on which the Stamp Duty of £50 has been Paid.

1352. G. H. Pierce.
1356. F. Patureau.
1384. J. Travis.
1401. A. Q. de Gromard.
1394. H. Rigby.
1309. H. A. Bonneville.
1424. W. E. Newton.
1425. W. E. Newton.
1442. W. Roberts.
1451. M. Henry.
1457. W. Walton.
1390. J. J. McComb.
1499. W. Clark.
1393. S. Blake, T. Lea, and E. Dutton.

Patents on which the Stamp Duty of £100 has been Paid.

1335. A. Mickelthwaite, J. Peace, and S. J. Hobson.
1350. G. H. and H. R. Cottam.

Journal of the Society of Arts.

FRIDAY, JUNE 15, 1866.

Proceedings of the Society.

Conversazione.

A Conversazione took place at the South Kensington Museum, on Wednesday evening, the 13th instant, when 3,540 Members of the Society and their friends were present. The company was received on entering by Mr. William Hawes, Chairman of the Council. The bands of the Royal Artillery and of the Coldstream Guards were in attendance, and performed selections of music during the evening.

Fifteenth Annual Conference.

The Fifteenth Annual Conference of the Representatives of the Institutions in Union, and the Local Educational Boards, with the Council of the Society, was held at the Society's House on Wednesday, the 13th inst., at 12 o'clock noon. William Hawes, Esq., F.G.S., Chairman of the Council, presided.

The following is a list of the Institutions and Local Educational Boards represented at the Conference, with the names of their respective representatives:—

Aldershot and Farnham Local Board	Mr. Barrow Rule.
Ashford Local Board	Mr. H. Whitfeld.
Banbridge (Ireland) Mutual Improvement Society	Mr. Alex. Black.
Banbury Mechanics' Institution and Local Board	Mr. J. H. Beale.
Birmingham and Midland Institute	Mr. Arthur Ryland.
Bury St. Edmunds' Athenæum and Local Board	Mr. John Jackson.
Carlisle Mechanics' Institute	Mr. Robert Ferguson, President. Mr. Edm. Potter, M.P.
Chatham, Rochester, Strood, and Brompton Mechanics' Institution	Mr. H. Adams. Mr. F. Butler. Mr. S. M. Heckford. Rev. A. R. Webster. Mr. Thos. Wilkins.
Chelmsford Literary and Mechanics' Institution	Mr. Thos. Moss. Mr. John Taylor.
Crewe Mechanics' Institute	Mr. R. Turnbull. Mr. H. Winfield.
Derby Local Board	Rev. J. Edwards. Mr. H. M. Holmes.
Dover Museum and Philosophical Society	Capt. Crookes, Vice-President. Mr. Thomas Lewis, Hon. Sec.
Gilford (Ireland) Young Men's Mutual Improvement Society	Mr. W. R. Masaroon.
Glasgow Institution	Mr. Alexander Craig.
Hastings and St. Leonard's Local Board	Mr. J. C. Savery.
Hertford Literary and Scientific Institution	Rev. Thomas Lander, M.A.
Hertford Local Board	Rev. John Davey. Mr. J. F. Foster.
Hull Young People's Institution	Mr. Paul Blackmore.
Kent Association of Institutes	Mr. F. W. Monk.
Lancashire and Cheshire Union of Institutes	Mr. Alderman Rumney. Dr. R. M. Pankhurst. Mr. Thomas Lawton.
Lichfield Free Library	Captain Dyott.
„ Local Board	Rev. J. L. Petit. Mr. William Browne.
London, City of London College	Rev. R. Whittington. Mr. J. H. Levy. Mr. F. Reynolds.
„ Highgate Literary and Scientific Institution	Mr. James Yates.
„ Lambeth Evening Classes	Mr. T. E. Heller.
„ Mechanics' Institution	Mr. T. A. Reed Mr. A. T. Rees.
„ Metropolitan Association	Rev. G. B. Macilwain. Mr. H. H. Sales.
„ Royal Polytechnic Institution	Rev. C. Mackenzie.
„ St. Stephen's Evening School	Mr. Joshua Cawood. Mr. W. H. Baker.
„ Walworth Literary and Scientific Institution	Mr. J. S. Noldwritt.
Manchester Mechanics' Institution	Mr. Alderman Rumney.
Peterborough Mechanics' Institution	Mr. S. Rutland, President.
Smethwick, Messrs. Chance's Library	Mr. F. Talbot, Hon. Sec.
Southern Counties Adult Education Society	The Hon. and Rev. S. Best.
Southport Athenæum	Mr. Thomas Milne.
South Staffordshire Association	Lord Lyttelton, President. Rev. Julius Lloyd. Mr. F. Talbot.
Swindon (New) Mechanics' Institution	Mr. J. L. Fallows.
Wallingford Mechanics' Institution	Mr. B. Atkinson.
Worcestershire Union of Institutes	Mr. J. S. Pakington, President. Rev. D. Melville. Rev. A. Waller.
Yorkshire Union of Institutes	Mr. H. H. Sales.

The Secretary read the following

Report to the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Gentlemen,—In recording the proceedings of the Union for the past year, I will remind the Council that though the appointment of visiting officers on the part of this Society in the District Unions was established in the former year, yet this year is the first in which the system has been in complete operation. These gentlemen have been extremely active and zealous in their duties, and fourteen new Institutions have been added to the Union during the past year, principally, I think I may fairly say, through their influence. As, however, an equal number have ceased their connection with the Society, in most cases through want of funds, the total number of institutions remains the same. The reports of these gentlemen as to the state of the Institutions in their respective districts (from which I shall presently quote)

are, upon the whole, favourable, but with the exception of that relating to the Lancashire and Cheshire Union, no very marked progress is recorded.

Before I quit the subject of the visiting officers I must not omit to notice the great loss which the Yorkshire Union and also the Society of Arts has sustained in the death of Mr. Barnett Blake, who admirably discharged the duties of visiting officer to the Yorkshire Union, both on the part of that body as well as of this Society. One better adapted for such work could scarcely be found; his untiring zeal, his remarkable intelligence, and his great facility in expressing his views, combined with true heartiness of purpose and genuine love for the work he was engaged in, rendered him peculiarly fitted for the duties to which he had devoted himself. A constant attendant at every Conference for many years, we shall sadly miss him, and the absence of his well-known face and familiar tones cannot fail to cast a shade of sorrow over the faces of his old friends whom I now see around me.

While I have noted the exertions of the visiting officers and their success in one direction, I regret to state that the number of candidates attending the Final Examinations has this year been less than last year, the figures being—for 1865, 1,199, whilst for 1866 the total has only reached 1,096. From what cause this has arisen it is of course difficult to say, but in comparing the tabular statement giving the number of candidates examined in the various localities this year with that for 1865, I observe that the Oldham Science School, which this year is combined with the Lyceum, has only twenty-five candidates, whereas these two Institutions last year sent no less than fifty-seven. I also notice that most of the Institutions at Glasgow, the South Staffordshire Association, and the Institutions at Bolton, Bacup, Devonport, and other places—which I will not trouble you by enumerating—all send up less candidates than last year. The number examined at Leeds, under the auspices of the West Riding Board, is also less, but this may, to some extent, be attributed to the death of Mr. Barnett Blake, above referred to, whose successor has not yet had time to make his influence felt in promoting the interests of education in that district. Turning to the metropolis I observe a great falling off in the number coming from the City of London College, who sent up about one-third less, though the success of that flourishing Institution in carrying off our prizes has been most remarkable. At the Royal Polytechnic Institution, however, the number of candidates has been larger.

While the numbers have decreased—and it is the first time since the establishment of the Examinations that I have not had to record an increase—it is somewhat remarkable that the number of those who have been unsuccessful is greater than last year, that is, with 1,096 examined this year the number who have not passed is 257, whilst last year, with 1,199 candidates, there were only 200 who did not gain certificates. This leads me to another matter to which I think attention should be drawn with a view of considering whether any steps can be taken to impress upon the Local Boards the necessity of greater strictness in certifying the fitness of candidates to be examined. It is a duty which the Boards owe, not only to the examiners, but also to the candidates themselves. The allowing unprepared candidates to come forward not only gives the examiners unnecessary labour, but, by the disappointment it causes to the candidates, is apt to discourage both them and others from coming up in future years. In some instances the candidates have shown in the papers worked such a complete ignorance, not only of the special subjects, but also of the very rudiments of education—spelling, grammar, and writing—that it is clear there has been such great laxity on the part of the Local Boards as to call for serious consideration on the part of the Council.

While, however, I speak strongly on this point, it is fair to add that, in reference to many of the subjects, the examiners speak in the highest terms of the qualifications and work of the candidates. I refer to the examiners' reports, which are appended hereto.

The number of papers worked this year in the various subjects is 1,570 as compared with 1,744 last year; and the certificates awarded on the present occasion are, first-class, 203; second-class, 420; third-class, 520, as against 315, 519, and 517 last year, whilst 427 papers have received no certificates this year, as compared with 393 who gained none last year. Notwithstanding this, the number of prizes taken is the same as last year, and the amount is larger, the figures being 51 prizes, amounting to £230 5s. this year, whilst last year the sum was £211 5s. These numbers include the Prince Consort's prize and the Royal Horticultural Society's prizes.

The Prince Consort's Prize is this year taken by James Rigby Smith, aged 25, of the City of London College, clerk, who has, in this and the three preceding years, obtained the following first-class certificates:—

1863. Political Economy—First-class Certificate.
" Arithmetic—First-class Certificate.
" Geometry—First-class Certificate.
1864. Book-keeping—First-class Certificate.
1865. Algebra—First-class Certificate, with Second Prize.
1865. Logic and Mental Science—First-class Certificate.
1866. Domestic Economy—First-class Certificate.

ELEMENTARY EXAMINATIONS, 1866.

Name of Union or Local Board.	Number of Centres.	Higher Grade.				Lower Grade.			
		Male Candidates.		Female Candidates.		Male Candidates.		Female Candidates.	
		Examined.	Passed.	Examined.	Passed.	Examined.	Passed.	Examined.	Passed.
Aldershot and Farnham District	2	2	2	..	..	13	11	5	2
Bessbrook (Newry)	1	2	2	..	..	2	1	..	..
Brighton	1	1	1	..	..	..	..	..	..
Carlisle Mechanics' Institution	1	1	1	..	..	..	..	..	..
Christchurch	1	10	6	3	3	18	14	18	11
Derby	1	10	10	..	..	..	..	..	..
Hertford	1	3	3	..	..	33	27	..	..
Hastings and St. Leonard's	1	2	2	..	..	2	..	..	..
Ipswich	1	6	4	..	..	..	..	..	..
Kent Association of Institutes	6	32	25	..	..	62	55	6	6
Lancashire and Cheshire Union of Institutes	53	175	88	..	..	605	270	165	50
Lichfield	1	3	1	..	..	10	10	..	..
Liverpool College	1	4	4	..	..	3	2	..	..
Newcastle Church of England Institution	1	4	4	1	1	..	..	..	..
New Swindon	1	9	9	..	..	16	9	..	..
Oldham Lyceum	1	5	..	..	..	13	6	6	2
South Staffordshire Association	12	51	29	1	1	121	61	11	5
Waterford	1	5	1	..	..	11	9	..	..
West Riding Educational Board	16	73	39	13	4	145	116	48	42
Worcestershire Union	8	26	20	..	..	44	26	14	10
York	1	..	..	..	..	1	1	..	..
Totals	112	424	251	18	9	1,099	618	273	128

The prizes in botany, offered by the Royal Horticultural Society, for gardeners, have been taken, but the Society of Arts prizes in this subject have not been taken, inasmuch as no candidate fulfilled the condition of obtaining a first-class certificate. In Floriculture, and in Fruit and Vegetable Culture, the prizes offered by the proprietors of the *Gardeners' Chronicle* have not been taken, because the candidates in these subjects, though taking first-class certificates, have not also taken certificates in book-keeping or mensuration, as laid down by the conditions of the offer. The number of gardeners who have competed for these prizes and certificates is ten.

Hitherto I have spoken only of the Final Examinations, held by the examiners appointed by the Society itself, but I must not omit to mention the Elementary Examinations, held by various District Unions and Local Boards, for which, as you are aware, the Society merely supplies the papers, the awards being made by the local authorities. The results of these Examinations are given in the following table. In order fairly to compare the figures with those given in my last year's report, it will be necessary to eliminate the Metropolitan Association, as that body did not use the Society's papers,* and has so far modified its system of elementary examinations that it has been thought better to speak of it separately from the rest. It appears, then, that in 1865, these examinations were held by 15 District Unions or Boards at 99 centres; this year, 21 District Unions or Boards have held them at 112 centres. In 1865, there were 1,460 candidates, of whom 620 obtained certificates. Of these, 464 were candidates in the higher grade, of whom 182 obtained certificates; 996 in the lower grade, of whom 438 obtained certificates; this year the whole number of candidates examined was 1,814, of whom, however, no less than 1,006 obtained certificates, the proportions being 442 higher grade, with 260 successful; and 1,372 lower grade, with 746 successful. The tabular statement shows that among the higher grade candidates were 18 females, 9 obtaining certificates; and among the lower grade were 273 females, with 128 successful; while, last year, there were in the higher grade 13 females, 5 of whom were successful; in the lower grade, 128 females, with 62 successful.

With regard to the Metropolitan Association, which is omitted from the list for the reasons I have given, I find that, last year, that body held their examinations at 16 centres. There were in the higher grade 88 male and 42 female candidates, of whom 20 and 7 respectively obtained certificates; in the lower grade there were 368 males and 86 females, gaining respectively 127

* This was, in fact, the case last year; but the difference was so unimportant that it was thought the results of the examination of that association might fairly be classed with those of other bodies.

and 35 certificates. This year, the corresponding numbers are—In the higher grade 37 male and 20 female candidates, of whom 13 and 14 respectively obtained certificates; in the lower grade 231 male and 57 female candidates, the certificates awarded being 150 to the former and 32 to the latter.

It appears, therefore, that there has been a material increase in the number of elementary candidates, which, I think, may fairly be attributed, to a great extent, to the influence of our visiting officers; but what is more remarkable is the much larger proportion that have been successful in obtaining certificates. As these examinations are held, however, entirely by the local authorities, I am unable to judge whether this is owing to any actual improvement on the part of the candidates, or to less strictness on the part of the local examiners. I am bound to hope that the former is the case.

As I said in my last year's report, these numbers, large as they are, inadequately represent the amount of encouragement really afforded to the progress of elementary education by the various Local Boards and Institutions connected with the Society. A considerable number of them prefer adopting a scheme of elementary examinations of their own. Indeed I am informed that this feeling is gaining ground in many localities, and you will have observed, in the list of subjects proposed for discussion by the Conference, the question—"Whether the Society of Arts should continue to furnish elementary papers to Unions and Local Boards, or whether it would be better for it to confine its attention exclusively to the Final Examinations?"

Upon this subject it would not become me to express any opinion; but there is a point in connection with it to which I cannot but draw the serious attention of the Council. The fact that the Elementary Examination papers, as well as the forms of certificate, are supplied by the Society of Arts, appears to have led to the false impression that these examinations are held, and the certificates awarded by the Society itself, and I hear from many quarters that the elementary certificates are frequently represented as "Society of Arts' certificates." If, therefore, it is decided to continue this system in future, it is a matter of the gravest importance that every effort should be made to disabuse the minds of employers of labour and others of this very serious error, for if it should become general, it would tend to impair the high character which the real Society of Arts certificates have gained, and materially to diminish the influence the Society has hitherto exercised in the promotion of education.

In order to afford you further information as to the state of the District Unions, I quote from the reports of our visiting officers:—

Mr. Jones, of the South Staffordshire Association, says:—

During the past year I have had frequent opportunities of visiting the various institutions which are in union with the Society of Arts, and have noticed carefully the nature of their operations. The principal feature in the work of the past season has been the continued success of the entertainments, which are now mostly held on each Monday evening, and, as a rule, the character of the amusements provided has been decidedly superior to former seasons. Though the entertainments, as entertainments, have been successful, they appear to have exercised in general a prejudicial influence upon the more solid work which institutions ought to perform. For instance, lectures and classes have not been so well attended, and in several cases classes which promised to be very useful, have been closed from want of students, and when evening schools are conducted by institutions, the teachers report that the entertainments do seriously interfere with the school work. I cannot report that, on the whole, there appears to have been much advance among the institutions under notice since the last annual Conference.

Mr. Lawton writes as follows:—

The Union of Lancashire and Cheshire Institutes comprises upwards of 120 institutes; 75 per cent. of which are named Mechanics, Educational, Literary or Working Men's Institutes; 17 per cent. Mutual Improvement Societies; 7 per cent. evening schools; and 3 per cent. Working Men's Clubs or reading-rooms. The Council of the Union attach great importance to class instruction, both in elementary and special subjects. In the discharge of my duties I am required not only to confer with officers and committees of institutes in respect of the operations of the Evening Classes, but also to instruct the classes, and make a monthly report to the Council. Further to stimulate teachers and pupils, general and local prizes are offered to the most successful candidates at the examinations, held under the auspices of the Union.

The following statistics will give some idea of the progress made in this district during the past year:—

	Month ending May 31st, 1865.	1866.
Recognised centres of Examination, being Institutes in union with the Society of Arts	29 ..	37
Institutes with successful candidates at the Elementary Examinations	45 ..	66
Total number of elementary certificates awarded	174 ..	406
Number of elementary certificates awarded to female candidates	15 ..	50
Institutes with Government science classes	23 ..	33
	1864.	1865.
Final Examinations of the Society of Arts—Number of certificates awarded	247 ..	280
Government Science Examinations—Total number of successful candidates	557 ..	853

Mr. Marcus, of the Worcestershire Union, writes:—

The number of Institutions and night schools in the Worcestershire Union remains about the same; there is, however, a larger proportionate number of members, especially females. The number of candidates this year for the Elementary Examination shows a considerable increase—58 for the lower, and 26 for the higher; total, 84, against 59 last year. The results of the Final Examinations have been equally gratifying as regards increase in numbers. It may safely be said that the advantages and desirability of the Society's Examinations are successfully working their way in this Union. The special prizes offered by the Union for the most

successful candidates in the Elementary Examinations (£2, £1 10s, and £1, for the higher, and four of 10s. for the lower), have a very good effect. The district visiting, in addition to frequent correspondence, has during the year brought the subject of examinations, and the claims of the Society of Arts, under the notice of twenty-four Institutes and night-schools.

Mr. H. H. Sales, in reference to the Yorkshire District writes at follows :—

The sudden death of my predecessor, Mr. Barnett Blake, a short time since, renders it impossible for me to report upon the work of the district during the past year. The returns show a large decrease in the number of candidates in the examinations in elementary knowledge, but this can be fully accounted for by the illness of Mr. Blake, who hitherto superintended all the arrangements, but this year failed in health just previous to the examinations being held, and consequently unavoidable derangements occurred that led to the disappointment of many candidates. A stranger cannot fail to be impressed with the heartiness with which educational work is carried on this district, and the results appear to be commensurate with the exertions made.

Mr. H. H. Sales, in reference to the Metropolitan District, writes as follows :—

There has been a great decrease in the number of candidates for the examination in elementary knowledge held during the past year. Exceptional circumstances may account for a small portion of the diminution in the case of a few local boards, but I am of opinion the real cause will prove not to be of an exceptional character. The bulk of class instruction in this district is carried on in evening classes, held in the National school-rooms. Under the new regulations of the Committee of Council on Education, these classes are eligible for State aid, and the managers readily avail themselves of the same; hence, the elementary examinations, conducted according to the scheme of the Society of Arts, conferring only honorary distinction of uncertain value, and not pecuniary assistance, do not offer sufficient advantages to interest managers and teachers. A large increase, year by year, in the number of candidates in the Final Examinations can hardly be expected. London has but few Institutions in which advanced classes are carried on, and, with scarcely an exception, these institutions are in union with the Society of Arts, and send almost uniformly the same number of candidates. The evening classes before mentioned, as at present organized, will send very few candidates to the Final Examinations. There is a great want in the suburban districts of purely educational institutions for adults, efficiently conducted upon a thoroughly liberal basis, to which the clerk and mechanic could resort for instruction. Unfortunately, while the mental material is ready to hand, there is a lack of experienced promoters, men combining zeal and energy with discretion and educational experience. As the suburbs become inhabited by the working classes the middle classes take up their residence farther outwards, and are thus unable to devote personal attention, without which an Institution cannot succeed. Failing these institutions, adult education is promoted by evening classes only, which, as a rule, cannot lead the pupils on to the attainment of so high a standard of knowledge as may be reached in a well organized institution. The division of the metropolis into District Local Boards has not proved successful. Even when confined to one parish, so many conflicting elements exist that, however pleasant in theory, the union of Evening Classes, Night Schools, and Institutions into one Local Board cannot be maintained. Complaints are numerous respecting the difficult papers set in many subjects in the Final Examinations; many candidates have been deterred from presenting themselves for examination, from the opinion that the examination papers are exceedingly stiff. I venture to submit that the questions in future papers should not, while requiring exact replies, enter so fully into details, a knowledge of which can only be gained by more lengthened study, and with greater facilities than are within the reach of the great majority of our students. The last winter sessions witnessed a large increase in the number of adult students in attendance at evening classes, due mainly to the impetus given to evening work by the Government measures. The standard required by the Committee of Council is so very moderate that there is abundant room for the Final Examinations of the Society of Arts, whose scheme requires to be constantly brought under public notice, although only the very best of the class students will reach the required standard.

P. Le Neve Foster, *Secretary.*

Appendix.

EXAMINERS' REMARKS.

The examiners in the respective subjects make the following remarks on the work done in this year's Final Examinations :—

Arithmetic.—The mechanical work in the various papers is neatly done, and is, upon the whole, fairly correct. There are still unmistakeable evidences that a little more attention to theory would amply repay the time bestowed upon it.

Book-keeping by Double Entry.—The number of candidates is on this occasion 209, against 275 in the examination of 1865. The quality of the papers generally is satisfactory, and some of them evince a thoroughly practical and intelligent knowledge of the subject.

Algebra.—Sixty-five candidates have presented themselves for examination in Algebra. Of these eight have gained 1st class certificates, 10 2nd class, 28 3rd class and 19, or rather more than one-fourth, have failed to qualify. Every question has met with a correct solution. The first-class candidates, and several of the second-class have acquitted themselves very satisfactorily; one of the former has gained almost full marks. On the whole the answering has been satisfactory, and the style of expression and mode of working out the answers exhibit a decided superiority over the performances of preceding years.

Geometry.—The candidates this year have, with a few exceptions, done themselves great credit; the number of first and second-class certificates bears a larger proportion to the whole than usual, and several of the more successful papers show a very solid and accurate knowledge of the subject. I have had very much fewer specimens of bad writing and spelling, and I consider that this year's result is very encouraging, although the numbers are still small.

Mensuration.—The paper is done much better this year than last. The first-class contains one-sixth of the candidates, and nearly half of them are in the first and second classes. The range of the marks, from nearly full marks down to zero, shows a remarkable difference in their knowledge of the subject.' The working is in many instances too bare, and would be improved by a few words of explanation. Linear is sometimes confounded with square measure.

Trigonometry.—The number of candidates continues to be small. The answers of the examined were better done than hitherto. In fact, every question proposed was worked out by some one or other of the candidates.

Conic Sections.—Seven candidates have sent in answers to the questions on conic sections this year, of whom six have passed very creditably, although no one has reached the standard required for a first-class certificate. The general average of the work is higher than of late years, and the number of candidates has increased. I trust

that others may be induced to study a subject which is, practically as well as educationally, of great value.

Navigation and Nautical Astronomy.—Of the two papers worked by candidates, one is good—the other but indifferent. The former of the two candidates is well versed in the theory, but in the solution of one of the questions has committed two curious errors. Too great care cannot be inculcated on candidates to secure accuracy of work.

Principles of Mechanics.—I am very much pleased with the papers worked by the candidates this year. As a whole, they are the best that I have inspected. Those papers which I could not pass have not been discreditable in one point of view. The failure is to be attributed, I imagine, to want of time for preparation, and not to defect in the answers given—to their paucity, not their quality. There is a marked improvement in the expression of ideas, precision of thought, and mathematical knowledge, which argues hopefully for the education of the country.

Practical Mechanics.—The present examination is a satisfactory one, the papers sent in being very much better than those which I received last year. Accordingly, one first-class certificate and five certificates of the second class have been awarded.

Electricity and Magnetism.—The papers this year are by far the worst I have ever had. Two papers are positively absurd, one being entitled to four, and the other to two per cent. No one is entitled to either a first or second-class certificate.

Light and Heat.—Three of the candidates this year have shown considerable knowledge on the properties of light and heat; but the remarks made last year apply in still greater force to the examinations of this year, that the candidates need more study in condensed and accurate methods, so as to enable them to make the best use of their time in examinations.

Chemistry.—The papers this year are less satisfactory than last year. This may, in part, be due to greater difficulty in the questions. I am, however, inclined to attribute it mainly to the fact that chemical theories have of late been so much altered by the great extension of our knowledge of facts, that many teachers have not yet fully matured their system of instruction in accordance with the theories now prevailing. I confidently anticipate great benefits to pupils and teachers from the change, once it is fully carried out—benefits such as have appeared elsewhere.

Mining and Metallurgy.—None of the papers of this year exhibit any remarkable degree of excellence.

Botany.—Of the nineteen candidates this year three return answers which are simply disgraceful, and the answers of five others are but little better. Seven have omitted to attempt the description of the specimens sent down. Altogether, I must class twelve as "not passed." One candidate sends very fair answers in structural, descriptive, and systematic botany, but fails in his physiology, and that apparently not entirely through haste in attempting too much. While of late years much stress has rightly been laid upon the importance of testing candidates in practical and descriptive botany, —testing their knowledge by actual specimens—it will not do to allow this to operate unduly to the detriment of the more purely physiological branches. At least one in the second class this year no doubt may take an honourable place in the first column should he try again. Bearing this in mind, from the low average and absence of any first class paper, I cannot regard the examination this year as satisfactory.

Floriculture.—The candidates scarcely rise above mediocrity in their appreciation of the intent and bearing of many of the questions put to them in this subject. They fail most especially, as a rule, in conveying clearly and concisely the purport of their own replies, and lose force of expression by multiplying words. They are strongly recommended, as a part of their studies, to practice the writing down of short pithy remarks on each of the subjects set down in the programme, comparing them with the statements in the text books, and repeating them from time to time, on each occasion cutting out all superfluous words, and in this way getting the essential particulars well impressed on the memory. The work is, on the whole, scarcely equal to what I should have expected.

Fruit and Vegetable Culture.—In reference to the papers on this subject I have to express my satisfaction that not less than one-fourth of them should be entitled to first-class certificates, and another fourth should be of such a character that, though they cannot rank in the first-class, they take an honourable position in the second. Another fourth comes closely on the second-class certificate, and consequently take a high place in the third class, and from the way in which these candidates, both of the second and third classes, have sent in their papers I feel justified in saying that, by continued diligence, and by the application of the knowledge they already possess, they will on a future occasion take a higher position than that which they have now gained. I am pleased to see the rising generation of gardeners devoting themselves to a study of the theory of gardening—to a study of those principles which ought to regulate every gardening operation, and without a perfect knowledge of which there can be no perfect practice. Practice without a knowledge of the principles by which it is governed is an insecure and baseless foundation on which to rest when natural conditions are disturbed or unexpected difficulties arise. I therefore urge on gardeners most strongly the necessity of studying the principles which regulate vegetation; but at the same time I desire also to see the fruits of that study exemplified in the practice, for a knowledge of the theory without the practice is worthless. Judging from what I have seen in these papers I am of opinion that there is a fine field for the Society to cultivate, in elevating the standard of gardeners. I would suggest that some means be taken to induce employers to influence young men in their gardens to go up for these examinations. It is a reasonable thing for an employer to demand, and it would be the means of raising a class of men much superior to that which we at present have, and which is by courtesy called "the gardening class."

Animal Physiology.—Amongst the papers this year there are none of marked excellence, though there are many which indicate that the subject has occupied the serious attention of the writers. A juvenile inability to grasp the subject, and a grievous deficiency in spelling, are still noticeable; but they are limited to a smaller number of candidates.

Domestic Economy.—The papers sent in at this examination are again an improvement on preceding years, but the number offering themselves for examination does not increase.

Political and Social Economy.—The examiner reports rather favourably upon the work of the candidates this year. Some of them, however, have only answered the questions referring to political economy proper; and the examiner desires to impress upon the candidates generally the importance of studying the institutions of their country.

Geography.—Upon the whole, I am hardly so well satisfied with the papers of this year as with those of some former years. The proportion of those entitled to first-class certificates is, indeed, a fair one, but a large number are of only third-class merit, and not a few are failures. The chief cause of failure appears to lie in the want of methodised study—directed to a definite purpose, and guided by better adjuncts, in the way of books and maps. I am aware that large allowance must be made for the limited opportunities which may be presumed to be at the disposal of many of the candidates; still, mere school-boy knowledge (which is all that a

large number of the answers exhibit) will neither secure the higher awards of the Society, nor be attended by the fructifying influences which information of larger scope—acquired by gradual and systematically-organised stages—exerts on the mind of the true student. Upon these and other points, I would strongly urge upon intending candidates for future occasions a closer attention to the conditions and suggestions offered in the programme.

English History.—I have great reason to be satisfied with the results of the examination. The answers of the candidates who have been placed in the first class are remarkable for fulness and precision. When I consider the variety of the questions, the extent of the period embraced by them, and that three hours only were allowed for the examination, I am astonished at the readiness and accuracy displayed by most candidates in the first-class, and by many in the second. I had expected that two-thirds only of the questions would have been answered, but many of the candidates have fairly grappled with the whole number. Of those who have not succeeded in passing some few showed themselves utterly incompetent; others, with a little more attention to the subject, might reasonably aspire to something better than a mere pass certificate.

English Literature.—The work has, I think, surpassed that of any previous year. The candidates have increased in number, and the proportion of those who have acquitted themselves well has never been greater. Even in the inferior exercises, a considerable improvement in the method of answering has shown itself. The candidates have been for the most part careful to master the meaning of the questions and to keep their answers to the point.

Logic and Mental Science.—There are only eight candidates this year. Two of these are altogether defective. Three show the results of a good deal of reading and thought in philosophy as well as a competent knowledge of formal logic. One shows a fair knowledge of logic and philosophy, and two a fair knowledge of logic without any attempt at answering in any further subject.

Latin and Roman History.—The work has decidedly improved this year in quality. All have passed, and one of the translations is excellent.

French.—The number of candidates that have not passed is relatively small this year, being only 25 out of 116. But whilst the average quality is satisfactory, I regret to find so small a proportion of first, or even second-class papers. This I mainly attribute to the evident neglect by most candidates of the works recommended to their notice in the programme of examinations. As a natural consequence of this neglect, the less elementary questions in Part II., bearing upon some very important and practical features of the French syntax as contrasted with the English, have been left unanswered by the greater number of candidates, and yet every one of those questions is to be found fully explained in the very first pages of one of the books recommended in the programme. How very much success depends upon the nature of the method pursued may be inferred from the fact that the successful papers come almost invariably in groups. Local Boards would, I venture to think, do well to look to this. I am also sorry to observe the many flagrant inaccuracies of several candidates in writing their own language.

German.—The papers of this year have been worked with great care and accuracy. Some of the candidates have managed to decline their nouns and conjugate their verbs almost without a fault. The translations from German into English are, with only few exceptions, free from misunderstandings. The rendering of the English into German bears evident proofs of progress. The essay, however, might be better; however brief, it ought, as is the case this time, not merely to assert again in other words the idea already contained in the theme, but should start from an acknowledged point and proceed argumentatively.

Italian.—These papers on the whole scarcely reach the point of merit attained by the candidates last year. The study of the language seems much too superficial if not negligent. Some, however, appear to have been worked with care, and show considerable knowledge of grammar, general construction, and idioms also; others are very deficient on these points of paramount importance.

Spanish.—The examiner reports favourably of the work done by the candidates.

Free-hand Drawing.—The three following subjects were given this year to the candidates for examination:—To draw heads from knowledge, to make an original design illustrative of the occupation of the draughtsman, and to make a drawing of a time-piece. The Local Boards supplied some very handsome time-pieces, from which a number of highly meritorious outlines have been made. Fifty-five candidates sent in fifty-eight drawings, three of which were heads, nine various designs for manufacture, &c., and 46 outlines from the time-pieces. Of the fifty-five candidates, four are deserving of first-class certificates, nineteen of second class, twenty-four of third class, and there are only eight who have not passed. This, as compared with previous years, is much above the average of certificates gained by the candidates in free-hand drawing at these examinations.

Geometrical Drawing.—The same causes which operated at the previous examinations have produced the failure at the recent one. The practical geometry of the line and plane is not sufficiently studied; most candidates seem to consider plane geometry as constituting the most important branch of the subject; as regards application in the arts, the reverse is the truth—plane geometry is of little use except as ancillary to solid. No one can be considered as tolerably grounded in this subject who could not construct every question in this division of the paper. That the time allowed was sufficient is proved by the fact that no candidate has constructed less than four and most have done six questions, while several have done seven.

Theory of Music.—The number of candidates this year is larger than before. I have been enabled to place nearly a fourth of them in the first class, and more than a fourth in the second. Many of the third class papers show accurate, though as yet limited, knowledge. The number of candidates "not passed" is small. This is a great improvement on any former year. Future candidates should bear in mind that wordy encomiums on great composers present no test whatever of acquaintance with musical history.

TABLE I.

This table shows the ages of the 1,284 candidates from whom return papers were received. Of these 1,096 underwent the final examination.

Age.	No. of Candidates.	Age.	No. of Candidates.
16	151	32	3
17	160	33	2
18	176	34	8
19	153	35	1
20	149	36	5
21	107	37	5
22	79	38	4
23	52	39	2
24	57	41	2
25	46	44	1
26	31	45	2
27	30	46	3
28	23	48	1
29	9	49	1
30	14		
31	7	Total	1,284

TABLE II.

Results of the Final Examination of 1866.

NAME OF LOCAL BOARD.	No. of Candidates Examined at Previous Examination by Local Board.	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who passed at Final Examination.	No. of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
Aberdeen	42	26	26	18	29	1	12	8	...	8
Aldershot and Farnham	7	7	7	6	12	2	6	2	1	1
Alton	...	...	3	3	8	1	4	2	...	—
Ashford	9	9	10	8	12	5	1	4	...	2
Banbridge (Ireland)	..	...	2	2	5	1	...	4	...	—
Belfast	6	6	6	5	8	3	2	2	...	1
Bessbrook (Ireland)	4	3	2	2	4	1	...	3	...	—
Birmingham and Midland Inst.	22	22	29	27	38	5	11	18	...	2
Blackburn...	11	11	11	5	15	2	1	4	...	6
Bradford	22	18	26	18	37	1	6	18	...	8
Brighton	1	1	1	1	4	2	...	2	...	—
Bristol	31	28	27	15	27	4	6	5	1	12
Burrage-road Evening Classes	24	23	21	13	21	1	5	7	1	8
Carlisle	12	12	10	7	13	...	6	4	...	3
Chatham, &c.	3	3	3	2	5	1	2	1	...	1
Chelmsford	...	..	2	2	3	1	...	2	...	—
Christchurch	49	24	6	4	9	2	2	2	...	2
Derby	10	10	11	11	21	4	7	10	...	—
Devonport	9	9	23	22	39	11	19	8	4	1
East Lancashire Union :—										
Burnley	27	27	35	30	59	10	7	27	2	5
Haslingden	...	...	9	4	12	...	2	3	...	5
Faversham	...	...	4	3	7	...	4	1	...	1
Glasgow (Athenæum)	22	22	27	27	31	10	15	16	3	—
,, (Institution)	23	21	17	13	20	2	7	6	...	4
,, (Mechanics' Institution) ...	103	66	59	45	64	6	17	26	...	14
,, (Popular Evening Classes, And. University)	15	12	17	14	20	1	9	6	...	3
Halifax (Working Men's College) ...	21	17	24	21	38	11	7	14	...	3
Hastings and St. Leonard's	2	2	4	4	8	1	2	4	...	—
Hertford	1	1	2	2	2	...	1	1	...	—
Hull	8	8	7	7	12	1	4	7	1	—
Ipswich	11	10	10	9	14	4	5	4	1	1
Lancashire and Cheshire Union :—										
Accrington	2	2	1	1	2	...	1	1	...	—
Alderley Edge	3	3	2	1	3	...	...	2	...	1
Ashton-under-Lyne	24	6	4	2	4	1	1	...	...	2
Bacup	8	8	10	6	15	1	2	3	...	5
Bollington	14	...	2	..	2	...	...	...	...	2
Bolton	16	16	11	7	13	...	2	5	...	4
Bury	7	7	8	5	17	...	1	5	...	3
Clitheroe	9	9	9	3	11	1	...	3	...	6
Crewe	3	3	9	5	19	...	4	4	...	4
Dean Mills	...	...	1	1	1	...	...	1	...	—
Droylsden	30	27	12	7	17	...	6	6	...	5
Farnworth and Kersley	8	8	9	3	9	...	...	3	...	6
Freetown, Glossop	1	1	2	2	2	1	...	1	...	—
Hyde	28	...	3	1	4	...	...	1	...	2
Macclesfield	3	3	4	3	8	...	1	3	...	1
Manchester Athenæum	5	5	6	5	10	...	2	4	...	1
Manchester M. I....	53	49	62	48	86	8	26	23	...	14
Mossley	5	5	6	6	7	...	6	...	...	—
New Mills	1	1	2	2	2	...	...	2	...	—
Oldham (Lyceum and Science School)...	28	20	25	19	37	2	8	15	1	6
Pendleton	3	3	2	2	4	2	2	...	...	—
Salford Working Men's College ...	36	35	44	36	56	6	22	16	...	8
Staleybridge	9	9	10	6	18	...	1	7	...	4
Stockport	7	7	6	5	11	1	3	1	...	1
Leeds Young Men's Christian Association ...	4	3	6	6	14	2	2	8	1	—
Leicester	...	...	2	2	3	...	1	1	...	—
Lichfield	11	11	14	12	18	1	10	4	...	2
Liverpool College	7	6	6	6	12	...	5	4	...	—
London (City of London College) ...	50	42	74	66	102	33	32	26	16	8
,, (Royal Polytechnic Inst.) ...	36	31	34	25	45	7	9	19	5	9
,, (St. Stephen's, Westminster) ...	6	6	8	7	13	..	2	7	...	1
London Metropolitan Association :—										
Bayswater	...	...	1	1	1	1	...	...	...	—
Lambeth	1	1	3	2	7	...	...	3	...	1
London Mechanics' Inst.	15	14	17	15	28	5	9	9	2	2
Paddington	1	1	1	1	2	1	...	...	1	—
Louth	3	3	3	3	3	...	1	2	...	—
Newcastle-on-Tyne (Church Inst.) ...	2	2	5	4	5	2	1	1	...	1
New Swindon	25	18	4	2	8	...	2	3	...	2
Paisley (Artisans' Inst.)	35	31	31	22	31	3	9	10	...	9
Pembroke Dock	3	3	7	6	13	4	6	1	1	1
Poole	...	...	1	...	1	...	...	...	...	1
Portsmouth	4	4	4	4	16	2	8	6	...	—
Richmond	1	1	1	1	4	2	...	2	3	—
Slough	9	6	12	8	19	2	3	8	2	4
South Staffordshire Union (10 Centres) ...	...	...	49	33	79	9	22	26	1	16
Southampton	19	19	23	18	30	3	7	12	2	5
Wakefield	3	3	4	1	4	...	...	1	...	3

TABLE II—(Continued.)

NAME OF LOCAL BOARDS.	No. of Candidates Examined at Previous Examination by Local Board.	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who Passed at Final Examination.	No. of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
West Hartlepool	2	2	2	2	5	...	3	1	...	...
Woolwich (Royal Arsenal)	15	15	21	12	33	1	5	6	...	9
Worcestershire Union	86	23	16	11	28	1	6	7	...	5
York	1	1	8	7	11	1	3	5	..	1
Yorkshire Union:—										
Acomb	1	1	2	2	2	...	...	2	..	...
Halifax Mechanics' Inst.	9	9	16	13	22	1	5	7	1	3
Hunslet	...	...	1	1	4	...	1	3	...	...
Leeds Mechanics' Inst.	11	11	17	14	31	5	9	9	1	3
Middlesbro'	6	6	5	2	6	...	1	2	...	3
Slaidburn	1	1	1	...	2	...	...	...	...	1
Thirsk	3	3	4	3	7	...	...	4	...	1
Wilsden	1	1	2	2	6	...	...	4	...	...
Totals	*1,168	*904	1,096	839	1,570	203	420	520	51	257

* No returns of the numbers of Candidates examined and passed at the "Previous Examination" were forwarded from the South Staffordshire Union (except Oldbury) and several other Local Boards.

TABLE III.—Number of Papers Worked in each Subject in the Four last Years; with the Result for the Year 1866.

SUBJECTS.	1863.	1864.	1865.	1866.				
				No. of Papers Worked.	No. of First-class Certificates.	No. of Second-class Certificates.	No. of Third-class Certificates.	No. of Papers in respect of which no Certificate was awarded.
Arithmetic	358	431	446	383	52	67	129	135
Book keeping........................	182	210	275	209	41	99	63	6
Algebra	81	93	68	65	8	10	28	19
Geometry	40	35	26	30	6	13	6	5
Mensuration	42	50	43	48	8	14	12	14
Trigonometry	12	13	10	9	2	3	2	2
Conic Sections	2	1	1	7	...	3	3	1
Navigation, &c.	3	4	4	2	1	...	1	...
Principles of Mechanics........................	11	8	11	16	1	2	6	7
Practical Mechanics	17	14	15	18	1	5	6	6
Magnetism, Electricity, &c.	21	22	19	8	...	...	4	4
Light and Heat	...	..	7	7	...	3	...	4
Chemistry	81	99	107	80	5	29	18	28
Animal Physiology	16	42	84	48	4	6	16	22
Botany	3	8	12	19	...	2	5	12
Floriculture	...	...	...	6	2	2	2	...
Fruit and Vegetable Culture	...	...	...	8	2	2	3	1
Mining and Metallurgy	16	11	6	3	...	2	1	...
Political and Social Economy	7	1	5	6	1	...	2	3
Domestic Economy	11	10	13	6	3	2	1	...
Geography	58	88	87	86	12	27	31	16
English History........................	71	89	94	78	7	19	17	35
English Literature........................	23	26	30	39	7	15	15	2
Logic and Mental Science	18	9	15	8	3	1	...	4
Latin and Roman History	16	21	9	9	2	4	3	...
French	88	77	99	116	5	23	63	25
German	18	26	19	9	3	4	2	...
Italian	...	...	4	5	1	2	...	2
Spanish	...	..	10	6	4	2	...	...
Free-hand Drawing	74	50	56	55	4	19	24	8
Geometrical Drawing	55	66	128	132	6	27	43	56
Music	32	28	40	49	12	13	14	10
Totals........................	1,360	1,540	1,744	1,570	203	420	520	427

TABLE IV.

OCCUPATIONS, PRESENT OR PROPOSED, OF THE 1,284 CANDIDATES FROM WHOM RETURN PAPERS WERE RECEIVED:—

Accountants (& Clerks)	4
Apprentices to the Linen Trade	3
,, Muslin Trade	1
Architects	7
,, Clerk	1
Assistants, Building Surveyor's	2
,, Clothier's	1
,, Laboratory	2
,, Land Surveyor's	1
,, Licensed Victualler's	1
,, Music Publishers	1
,, in Observatory	1
,, Pawnbroker's	1
Attendant (sick-berth)	1
Auctioneer's Clerk	1
Baker	1
Bandsman	1
Blacksmiths	2
Block-cutter	1
,, maker	1
,, printers	2
Boiler-makers	3
Book-binders	2
,, sellers and assistants	4
,, keepers	34
Boot closer	1
,, maker	1
Brass-finishers	4
,, founders	2
,, moulder	1
,, turner	1
Bricklayers	9
Brushmakers	3
Butchers	2
Cabinet-makers	6
Card-room hand	1
,, maker	1
Carpenters	13
Carpet-weavers	6
Carriage body-maker	1
Carter	1
Cashiers	6
Chemists (& assistants)	20
,, and dentist	1
,, and Druggists	5
Choristers	2
Civil Engineers	9
Clerks, Bankers, Commercial, &c.	338
,, Carriers'	2
,, in Civil Service	2
,, Colliery	4
,, Customs	4
,, and Draughtsman	1
,, Insurance	1
,, Law, &c.	17
,, Ordnance Survey	2
,, Railway	16
,, Surveyors	3
,, Savings Bank	1
Clicker	1
Clog-makers	2
Cloth-lapper	1
,, dresser	1
Coach-builders	3
,, painters	2
Coal-agents	2
,, dealer	1
Collectors	4
Collier	1
Colour-mixer	1
Commercial Travellers	5
Compositor	1
Correspondent	1
Customs' Officers	2
Cut-looker	1
Dentists	2
Die sinker	1
Drapers, &c.	5
Draughtsmen	10
Druggists, &c.	7
Dyers	2
Engineers	43
,, Clerk	1
,, Mining	1
,, Naval	3
Engine-driver	1
,, Fitters	11
Engraver	1
Errand-boy	1
Excise Officer	1
Factory Operative	1
Fancy Leather-worker	1
Farmers	2
Fitters	21
Foremen	2
Gardeners	14
Gas fitter	1
Glass-engraver	1
,, painters	7
,, stainer	1
,, trade, in the	1
Goods-agent	1
Governesses	10
Grinders	2
Grocers, &c.	9
Gunmaker	1
Hackle-setter	1
Harness-makers	2
,, weaver	1
Hawker	1
Hosier	1
Hotel-keeper	1
Inland Revenue Officer	1
Ironmongers	2
Iron-moulders	4
,, turners	6
Jewellers	2
Joiners	23
Labourers	4
Lamp-maker	1
Letter carrier	1
,, sorter	1
Librarian	1
Lithographer	1
Lock-makers	2
Machine-maker	1
Makers-up	3
Maltster	1
Manager	1
Manufacturers	2
Masons	2
Measurers	2
Mechanics	30
Medical students	3
Merchant	1
Messengers	2
Meter-inspectors	2
Millwrights	8
Moulder	1
Oil and Colourmen	2
Optician	1
Overlookers	3
Overseman	1
Packers	2
Painters	2
,, and Gilder	1
Pattern-makers	7
,, designers	3
Pavior	1
Perfumer	1
Piecers	5
Piece looker	1
Ph. D.	1
Photographer	1
Photo-inst.-maker	1
Plasterer	1
Plumbers, &c.	5
Pocket-book maker	1
Police-serjeant	1
Poor law officer	1
Porter	1
Postman	1
,, messenger	1
Post-office stamper	1
Printers	7
,, lithographic	1
Pupil teachers	48
Railway-carriage builder	1
Reader	1
Registrar of Births and Deaths	1
Road-labourer	1
Saddlers	2
Salesmen	5
Schoolmasters	10
Schoolmistresses	2
Self-actor minder	1
Sewer-pipe maker	1
Shawl cutter	1
Ship chandler	1
Shipwrights	22
Shoemakers	2
Shopmen	2
Shorthand writer	1
Silk-sizer	1
,, weaver	1
Silversmith	1
Sketch-maker	1
Small-ware manufacturer	1
Smiths	2
Spindle-makers	3
Spinners	6
Spur-plater	1
Staff-serjeant	1
Stationers (& assistants)	4
Stock-keeper	1
Stone cutter	1
,, masons	2
Store-keepers	3
Student in School of Art	1
Stuff merchant	1
Tailors	6
Teachers (others than pupil teachers)	28
Telegraph operator	1
Time keepers	3
Tool-makers	2
Turners	8
,, and fitters	5
Tutor	1
Undertaker	1
Upholsterers	2
Warehousemen & lads	59
Watchmakers	3
Weavers	42
Wheelwright	1
Whipmaker	1
Whitesmiths	2
Wire-drawer	1
Wool-sorters	11
Woollen trade, in the	2
Worsted-spinner	1
Writers	4
Undetermined, or not given	35
	1,284

The report of the discussion will appear in next week's *Journal.*

FINAL EXAMINATION, 1866.

A second prize of £3 in Geometrical Drawing has been awarded to No. 738—W. Vaughan, aged 25, of the City of London College, clerk, as well as to No. 1077—Henry B. Dorrell, as already announced.

From the "List of Certificates awarded to Candidates," given in last week's *Journal*, omit "507—Brock, David, 20, Glasgow Inst., clerk—Geog. (2d)."

PARIS UNIVERSAL EXHIBITION, 1867.

Meetings of the intending metropolitan exhibitors in classes 35, 37 38, 41, 42 and 43, have taken place at the Society's house during the past week, and sub-committees have been appointed for the allotment of space amongst the claimants in each class.

Proceedings of Institutions.

HALEY-HILL WORKING MEN'S COLLEGE AND YOUNG WOMEN'S INSTITUTE.—The annual report, presented last Easter (the end of the 11th year), testifies to the con-

tinued general success of the Institutions. During the past year, and indeed ever since the opening of the Working Men's College, numbers have never been wanting. To the utmost extent of the accommodation the college classes have at times been filled, and the average attendance, more especially of the younger students, has been very good. The Scripture class has been attended by many of the most intelligent and thoughtful students, the average being about fifteen; it is confined to the senior students. The English Literature and Grammar class has attracted a fair number of students. In Arithmetic no fewer than 133 candidates presented themselves at the late examination in the college. The numbers presenting themselves for instruction in Bookkeeping were so great that it was deemed expedient to have two classes; the first, or advanced class, being composed of those who had already taken certificates in this subject at the Society of Arts Examinations, or were known to be very fairly conversant with the subject. The junior students have been taught the more elementary principles, and both classes have acquitted themselves very well at the recent local examination. The Science classes have not been so well attended this year as last. The class in Zoology has been altogether relinquished. On the whole, the call for scientific teaching seems at present by no means commensurate with that for elementary instruction. The Social Economy class has been fairly attended by both the senior and junior divisions of the college. On this point the committee observe:—"Every day more clearly demonstrates the necessity for all intelligent men having a fair knowledge of the principles on which the just relations between all classes of society are based. No time is so well calculated for the implanting of a proper knowledge of these principles as the period of opening manhood, when the intellect is sufficiently developed to grasp the subject, and before the judgment is warped, or the mind prejudiced by the misrepresentations of many professing themselves to be the friends of working men." The Geography and History classes have been well attended; and a class in French has been commenced. The Young Women's Institute has not progressed in numbers during the past year to the satisfaction of the teachers. Evening classes for females have been opened in various other parts of the town, thus lessening the area whence scholars were drawn to the Institute. It appears that the total number now on the books of the College is 248, and the average attendance is about 150. In the Young Women's Institute the total number on the books is 54, and the average attendance about 30.

Wednesbury Mechanics' Institution.—The twenty-eighth annual report speaks of a succession of difficulties which have attended the Institute for the past few years, and a continuance of the struggle with the downward tendency which has so continuously manifested itself. The year has been more than usually eventful as regards the stability of the Institute. The financial statement shows the receipts as £49 12s. 7d., and the expenses £64 8s. 11d., being an excess of expenditure of £14 16s. 4d. Against this amount there was a balance at the beginning of the year of £3 7s. 6d., thus showing a deficiency of £11 8s. 10d. There has been a considerable falling off in the subscriptions, and towards the close of the year, the committee, having received further distinct notices of withdrawal, which, upon an estimated statement, appeared to affect seriously the position of the Institute, had no alternative but to resolve upon recommending to the members the winding up of the Institute. The necessary resolutions were submitted and passed at a special general meeting held Feb. 16th, and the committee were proceeding to carry them into effect, when another meeting was held, and several members, feeling great regret at having to close such an Institute, undertook a canvass, and ultimately a statement was made which promised an increase of income of upwards of £30. This justified the members in rescinding their former resolution, and in deciding to continue the Institute. In addition to the promised increase of revenue, the committee contemplate a reduction in several expenses. The committee have not thought it desirable, owing to previous losses, to undertake any course of lectures or entertainments, neither have any classes been held this year. No additions have been made to the library during the year, but the circulation does not appear to have been affected to any remarkable extent by this fact, the number of volumes taken out amounting to 1,500.

PARIS IMPROVEMENTS.

There is no diminution in the work of demolition and reconstruction which has now for several years proceeded with such unprecedented rapidity, and which seem destined in the end to obliterate nearly all the old land-marks of the city of Paris. The alterations which are being made in the neighbourhood of the Champ de Mars are naturally, with a view to the coming Great Exhibition, being pursued with more than ordinary vigour; the excavation of the heights of the Trocadero for the new Place of the King of Rome, so named from the fact that it was on that spot that Napoleon proposed to erect a palace for his son, the young "King of Rome," are being carried on by night as well as by day. Thousands of cubic yards are being carried by rail across the Seine to the Champs de Mars every day. It is at night that the sappers fire the mines which are gradually reducing the heights of the Trocadero to masses of rubbish. The earth-works are completed in parts, and the ground is being levelled for the grand esplanade of the Place du Roi de Rome. This esplanade will be upwards of sixteen hundred feet in length by about eight hundred in width, and there will be eight wide boulevards or avenues, in addition to the bridge of Jena, leading from it to various parts of Paris and Passy.

An interesting discovery was made the other day in the old island of the Cité, in the demolitions now going forward on the site of the new building for the hospital of the Hôtel Dieu. An enormous oak beam, more than fifty inches square, was found in one of the oldest houses; it was but little worm-eaten or decayed, and on one of its faces was found the following inscription, in rude but perfectly legible characters:—"I was placed here in the year 1450, and I was six hundred years old when I was taken out of the forest of Rovray." If this inscription is authentic, and the age of the tree were not overestimated, the tree from which this gigantic piece of oak was cut must have been almost contemporary with Charlemagne, and the wood must now be more than a thousand years old. One of the most remarkable instances of reconstruction now under hand is that of the corner of the Palace of the Tuileries nearest the river, called the Pavilion of Flora, and the long gallery which connects it with the Louvre. The pavilion, finished as regards the main work, is now in the hands of the sculptors and decorators, and begins to present a very imposing aspect. The upper part of the pavilion has two very important decorations; on the western face an ornamental fronton, surmounted by a colossal group of three figures, representing War, and, on the southern face, another group of the same dimensions, illustrative of Peace and Agriculture; the former of these beautiful frontons is by M. Cavelier, and the latter by M. Carpeaux, two of the most eminent sculptors in France. The wing, which will include, in that part nearest to the pavilion, a new *salle d'etat*, or hall, for the meetings of the Emperor and the members of the two chambers; in the other portion, the extreme end of the great gallery of the Louvre, which has been demolished, and, below, a series of fine arcades giving access to the Place de Carrousel, is not so far advanced as the pavilion. It is, in fact, a very extensive work, and consists of nine parts, each crowned with its pediment, and the style is in accord with the

beautiful gallery of which it is a continuation. It is, moreover, the most elaborately decorated work which has been undertaken in Paris for many years; the whole of the upper portions of the building are covered with sculpture and ornaments. The lower part of the river front is Doric, with fluted pilasters ornamented with vine and ivy leaves, the capitals bearing lions' heads, crosses of the Legion of Honour, and bees. The pediments are alternately curved and pointed, and the frontons are decorated with the following sculptural works:—Agriculture, by M. Carrier-Belleuse; Navigation, by Madame Bertaux; Astronomy, by M. Ferrat; Commerce, by M. Choiselat; Amphitrite, by M. Cabet; Concord, by M. Walter; and Sculpture, by M. Perray. The roof is pierced by two rows of highly-decorated dormer windows and otherwise ornamented. The inner side of the wing is of the Ionic order, after the model of the central portion of the palace, by Philibert Delorme. The frieze is decorated with subjects representing commerce, war, music, and the chase. The first floor is Corinthian, the capitals of the pilasters bearing rams' heads; between the windows are niches for statues, and over them a series of medallions of Roman Emperors and poets. The attic story is similar to that of Philibert Delorme. The ornamentation of this portion is exceedingly rich; near each window is a seated figure, corresponding with the subject of the fronton above, executed in bas relief, and surrounded by laurels, and above these are groups of animals by the sculptors Delabrière, Cani and Fremiet,—two lynxes chained, and a Minerva; two dogs and a globe sprinkled with bees, and crowned with an imperial diadem; two hounds and a woman's head, with branches of oak and laurel; two otter hounds attached to a stag's head; two panthers chained to a vase filled with grapes. The first fronton, representing Diana the huntress, is by M. Merley, and beneath it are two figures of huntsmen, with implements of the chase. The second fronton is devoted to glory, and is from the chisel of M. Gumery; beneath is a man with a trident, and a Roman warrior, holding a javelin and a small shield with a lion's head. The subject of the third fronton is the rape of Europa, by M. Demesmay, with figures of a German warrior and a Roman soldier beneath. The fourth fronton is decorated with a group entitled History, by M. Franceschi, with figures of a soldier and a sculptor below. The fifth represents a Dryad, by M. Delaplanche, and beneath are Neptune and a youth, representing a river. On the sixth fronton will be a figure of Venus, by M. Vitani, with tritons blowing trumpets. The seventh represents Power, by M. Thomas, with figures of Hercules and Samson. On the eighth M. Perrault is to execute a Victory, with warriors below. The ninth and last fronton, which projects beyond the rest, are to be Cupid, by M. Soitoux, with figures of a woodman and an artist. On the entering angle, between the eighth and ninth frontons, will be two figures, Apollo holding a lyre and a laurel crown, and Paris, with crook and apple of discord. The whole of the pediments are connected by a balustrade, on which are vases decorated with masks of fauns, and crowned with flames. The roof on this side has a double range of windows, ornamented with rams' heads and garlands of flowers, the whole being executed in that rich lead repoussé work, which has lately been revived with such admirable effect. In this mechanical age too much encouragement cannot be given to works of this class, which form the strongest link between the artist and the *ouvrier*. The Louvre, the Tuileries, the Hotel de Ville, and other buildings, present much deserving of study in this kind of work. Before the summer is over the whole of the newly-constructed portion of the two palaces will be completed, at least as regards the interior, and the grand river front will then present a consistent whole, the beautiful work of the sixteenth century being no longer brought into comparison with the heavy inartistic building of the eighteenth century.

BELGIAN METHOD OF TEACHING DRAWIN

Last autumn, M. Hendrickx, inspector of the dra
classes in the communal schools of Brussels, was auth
ized by the Minister of Public Instruction to make
experiment in the Lycée Bonaparte, in Paris, of a sy
which is reported to have yielded excellent results in
gium. Fifty adults answered the invitation; they con
of students of the Polytechnic and Philotechnic Ass
tions, commercial clerks, fitters and mechanics, in
employ of the Orleans Railway Company, and
workmen. With one single exception, the whole
these adult pupils were totally ignorant of drawing.
twenty-two lessons of one hour's duration each.
some unaided practice at home, the pupils were a
execute complicated designs with a firm hand and
siderable taste. At the urgent request of the clas
Minister has decided that the experiment shall be
tinued, at the cost of the State, in the Lycée Ch
magne, by M. Bourson, painter, and associate of
Hendrickx. The same gentleman has been appoint
conduct a similar course for the pupils of the pr
normal school of Versailles, and another espe
adapted for the teachers of the Seine-et-Oise.
system is also now under trial at Lyons.

The course established at the Lycée Bonaparte
mentioned in the *Journal* at the time; and it will
interesting, and perhaps useful, to reproduce a
of the report made on this method of teaching,
M. Armand Dumaresq, a well-known historical pa
and president of one of the classes for the Exhibi
1867, has made officially to the Minister of Public
struction in France.

M. Dumaresq says that the method of M. Hen
is a compilation from ancient systems. The bases of
science of drawing were laid down by Leonardo da
and by Albert Durer, who published a treatise on
ing in 1557. All modern authors, says the
from Paillot de Montabert downwards, have
from Albert Durer. The work of the last-named
comprises the geometric system of including wi
square or a cube the figure that is to be demonst
M. Hendrickx quotes this idea, and makes it the fo
tion of his whole system. This method of framing
known figure the design to be drawn is good,
enables the pupil to pass readily from the known to
unknown; he finds in the horizontal and perpendi
lines of the diagram a series of starting-points,
serve the same purpose as those used by sculptors in
roughing out of a block of marble.

Albert Durer advocated the principle of designin
compass and rule as the Greeks did; Michael A
was the first to set up the dictum that an artist's co
should be his eye, and from that time the pa
Raphael amongst the first, abandoned the method of
Greeks, and a revolution came over art.

M. Hendrickx, in taking up this forgotten me
has, then, not invented a new system, but only m
discovery in the past. A good idea of his mode of
ing out this system will be obtained from a descripti
four books of the first and second degree. The first
contain the demonstration of lines and surfaces, and
application to forms represented geometrically,
cubes, figures derived from the cube, and invariably en
in a cube, sections, cylinders, cones, pyramids,
and spheres, and, lastly, curves of the teeth of
balusters and vases, the series being carefully gra
The other two books contain the construction of
principal generic figures:—First, a portion of for
the first degree, with their shadows; then the cle
of the proportions of the Tuscan order; of the leave
living plants, such as the vine, oak, laurel, narcissus
acanthus, and their analyses in an ornamental poi
view; lastly, the proportions of the human head
body. These models are well designed and well ch
and their decorative quality is made clearly appare
the student. The third series of books, or copies,

tains the compliment of the two former, and prepares the pupil for the study of the round.

Whatever may be the merit due to M. Hendrickx for having adopted the method of the Greeks as taught by Albert Durer, his practice in teaching deserves the greatest attention; the principal point consisting in the fact that the students draw with chalk upon the black board from the model produced before their eyes, in the same manner, by the teacher, who at the same time explains to them the method by which he produces what he places before them for reproduction. The pupils copy the drawing upon whatever scale they please, and the teacher points out any errors into which they may have fallen; between one lesson and another the students are expected to reproduce on paper what they have previously drawn on the board, choosing, as before, whatever scale or size they please, but of course preserving the proportions. The result of this reproduction from memory gives the exact measure of the appreciation of the lesson.

M. Dumaresq says, "I have seen some of these drawings made in such a manner that they might serve for models." Such a declaration is another proof of the well-known fact that in drawing as well as in everything else, intelligent teachers produce intelligent pupils.

That which is so difficult in ateliers, to continue our quotations from the report in question, namely, reproduction, on an enlarged or diminished scale, is no difficulty with M. Hendrickx's pupils; and it is a great point to have arrived at this, as workmen especially are compelled in practice to submit to the material necessities of their productions.

"I prefer," says M. Dumaresq, "this method of teaching to that of others—courses in which the models are not sufficiently gradual, where the pupil often chooses for himself the drawing he is to copy, and where the teacher gives his instruction in the same manner as if he had before him a class of youths devoted exclusively to the study of art." The progressive nature of the Belgian system furnishes guides for the master as well as for the pupil; they are forced to work together. If the duty of the teacher, who must have special aptitude, is far more onerous, the results are far more satisfactory than usual; he cannot confine himself to the giving of a certain amount of advice which any one may do; he must draw in presence of his pupils, and he thus offers to them the proofs of his demonstration. The results of the courses of M. Bourson are highly satisfactory; the drawings produced during the two classes conducted by him in Paris and at Versailles, amount to between five and six hundred; the Paris course only comprised twenty lessons—it began at the end of November and finished on the 10th of February. The number of pupils inscribed on the books was fifty-three, thirty-six only persevered throughout, and of this latter number seven had already studied drawing to some extent. "The results," says M. Dumaresq, "are very good." The pupils themselves express their opinion strongly in favour of the Belgian system.

The experience thus obtained in France, where drawing has been cultivated with much assiduity, of a system which originated in a foreign country, and the continuance of similar courses of instructions, under the authority of so zealous and intelligent a Minister of Instruction as M. Duruy, together with the testimony of M. Dumaresq, as contained in the official report referred to, give to the method of M. Hendrickx the highest claim to attention.

Fine Arts.

Art Exhibition at Lille.—The town of Lille is preparing an exhibition of works of art to which considerable importance will be given. The Emperor has placed a prize medal, of the value of one thousand francs, at the disposition of the management, and the Comte de Nieuwerkerke has informed the authorities of Lille that His Majesty will select from the exhibition the picture which he intends to present to the musenm of that town.

Provincial Exhibitions in France.—The Bourdeaux exhibition is one of the most important after Paris, and the amount expended for works of art this year exceeded £2,057; of this, nearly £1,200 was paid by private persons for 60 works, rather over £800 for 34 works purchased by the society by which the exhibitions are instituted, and £60 by the authorities of the town for one picture; the total number of works purchased being, consequently, 95, and the average price between twenty-one and twenty-two pounds each. In the list of the painters whose works were sold are the well-known names of Rousseau, Antigua, Landelle, Boulangé, and two of the medallists of the present Paris Exhibition—Claude and Brown. The Society of the Friends of Art of the department of the Yonne, purchased fourteen works out of a small exhibition recently held at Auxerre. Considering the immense number of exhibitions opened every year by these local societies, large and small, the money annually devoted by the provinces to the purchase of works of art must amount to a very considerable sum.

The Union Centrale des Beaux Arts, established two or three years ago in Paris, and to whose management was due the admirable exhibition of retrospective art held in the Champs Elysées last year, has received such an impulse from the publicity derived from that exhibition, that the adhesions and subscriptions to the society have enabled the directors to throw the doors of their institution open to the whole world of operatives without any charge whatever. The library and museum of the Union, in the fine old square called the Place Royale, are now open to all comers five days in the week—Friday only being reserved for the founders and subscribers, from ten till five o'clock, and from seven till ten in the evening. The lectures, which are given on three evenings in the week, are also gratuitous.

Manufactures.

Locks and Keys.—At a recent meeting of the Institution of Mechanical Engineers, a description of a new construction of lock and key was communicated by Mr. J. B. Fenby, of Birmingham. The writer pointed out that in all previous locks there had been two important defects in principle, which are fatal to their security—the first being that, although access to the works of the lock is greatly impeded by many ingenious contrivances, they still admit of the works being got at through the keyhole, and thus allow of a series of attempts being made to pick the lock; while the second defect is the possibility afforded for repeating the trial of a false key, and thus perfecting it by successive alterations after trial. In the new lock described in the paper, which is the invention of the writer, the principle is adopted of dividing the key into two parts, the bit or portion by which the levers of the lock are raised being separate from the stem or handle of the key. For unlocking the lock the bit is inserted through a second keyhole into a radial slot contained in a solid rotating cylinder, the cylinder being then turned round by the stem of the key acting in the centre keyhole; the bit while being carried round is also pushed outwards along the radial slot by means of a cam, and is thus made to protrude from the circumference of the cylinder sufficiently to act upon the levers of the lock, and thereby set the bolt at liberty to be withdrawn. The bit is then pushed out of the radial slot, and drops into a receptacle inside the door; and the further revolution of the cylinder with-

draws the bolt, and unlocks the door. The consequence of this mode of construction is that, as soon as the bit has been inserted in the lock and the cylinder turned round for unlocking, the radial slot in the cylinder is carried away from the keyhole, which is completely closed by the solid cylinder, whereby all access to the interior of the lock through this opening is effectually prevented, nor can anything be passed into the lock in this way except a detached bit of metal not larger than the bit by which the lock is opened. The centre keyhole, into which the stem of the key is inserted for turning the cylinder, is simply a blind socket with parallel sides, and without any communication with the interior of the lock. The only possibility of opening the lock by fraudulent means lies, therefore, in the use of a counterfeit bit introduced into the lock in place of the true bit; but this counterfeit is absolutely lost to the operator and retained inside the safe at the very first trial, so that he is not only limited to a single attempt, but from the attempt itself no clue whatever is obtained as to the nature of the defect in the counterfeit. In consequence of the levers not being accessible for feeling through the keyhole, and therefore not requiring to be all shaped to the same average curve at the portion acted upon by the key, each lever can be shaped to its own proper curve, and the play in the action of the levers is thus reduced to a minimum; hence a much slighter amount of error in the counterfeit than is admissible in the case of previous locks will prevent its opening this lock. The importance of these advantages in the principle of the new lock is illustrated by the celebrated bullion robbery on the South-Eastern Railway some years ago, which attracted special attention from the remarkable skill with which it was accomplished and the large value of the property stolen; but even in this case success was not attained until as many as seven trials had been made with the same false key, the latter being altered after each trial according to the indications obtained from the trial, until it was at last sufficiently perfected to be capable of opening the lock of the bullion safe. In that instance also the successive trials were made without leaving any indication behind that the lock had been fraudulently attempted, although it was fitted with detector contrivances for this special purpose; but in the present lock the false bit, being retained inside the safe, is found when next the safe is opened, and furnishes proof of the fraudulent attempt having been made, as well as showing how near the counterfeit key has approached to the original. The locks are made with six levers, and the corresponding steps in the bit are cut with the greatest accuracy by a machine specially contrived by the writer for the purpose, with a permutating arrangement, having an extent of permutation admitting of each lock differing from every other lock made. For locking the lock, the stem only of the key is required, as the bolt is shot simply by turning the cylinder; and as the keyhole for the stem is made with a notch cut out on one side only, while the cylinder is not permitted to make a complete revolution, the key stem cannot be taken out of the lock whilst it remains unlocked. This lock has an important advantage in simplicity as well as solidity of construction, as there are no more than sixteen separate pieces altogether in the complete lock; moreover, as both keyholes are simply blind holes with parallel sides, having no communication with the interior of the lock, they do not admit of injury to the lock by the explosion of gunpowder. Specimens were exhibited of the new lock, the action of which was shown both with the true key and with counterfeit keys; and it was shown by trial that the counterfeit failed to open the lock notwithstanding that, by means of the permutating cutting machine, it had made a much nearer approach to a perfect copy than was practicable in the best handwork from a wax impression. The key-cutting machine, for cutting the bits, was also exhibited, having been lent for the purpose by Messrs. Whitfield. of Birmingham, the makers of the lock.

Commerce.

Supply of Gas to London.—The Committee of the
House of Commons have brought their inquiry into the
supply of gas to the metropolis under the Act of 18
to a conclusion, but they have still to deal with the G
Bills of the various companies, referred to them by
House. It appears from the returns which have
laid before them, that the total revenue paid by the co
sumers and the public for gas in the metropolis, amo
to the large sum of £1,767,261 19s. 9d. per annu
This is the total for the year ending 31st December, 1
and it increases every year with the growth of
metropolis and the increased consumption. This
sum has been levied most unequally. The London G
light Company have been charging their consum
in outlying districts, 5s. per 1,000; the Phœnix Co
pany have been charging in their outlying distr
4s. 9d. per 1,000; whilst the Independent and So
Metropolitan have been charging 3s. 4d. per 1,000
A consumer, therefore, living in a street where
South Metropolitan and the Phœnix districts join,
been compelled by Act of Parliament, under the
tricting system, to take gas from the Phœnix at 4s.
whilst the South Metropolitan, whose pipes run thro
the same street, were willing to supply it to him
3s. 4d., but were not allowed to do so. It appeared,
that the West-London Junction Company is making
supplying gas at this moment, at a profit, for 3s.
per 1,000 feet only, being the same article as to p
and illuminating power as the Imperial Gas Com
supply to the same district at 4s. 6d.; but the W
London Junction Company cannot compete with
rivals, being limited to the Great Western
and Railway Station under the contract entered
before the Act passed in 1860. Assuming that all
gas companies could produce gas at the same
public, since the Act of 1860 came into operation,
been actually paying one-third more than they
for their gas, entailing the enormous loss to the
habitants of London of nearly £600,000 per
The committee have not limited their investigation
the price of gas, but have inquired into its purity
illuminating power, and have taken evidence that
gas of London is inferior in both respects to that of
other towns of England. Messrs. Howell and J
produced silk goods the colour of which had
entirely taken away by the gas consumed in their
and Mr. Medwin, of Regent-street, produced boots
tore up like brown-paper; and although the organ of
gas companies suggest that the rottenness of the
was produced by blacking, the suggestion can sc
apply to a pair of boots which have not left the
maker's shop. As to illuminating power, the wit
were unanimous in their statement of the dark con
of London as compared with Edinburgh, Glasgow,
chester, Birmingham, Plymouth, Brighton, &c. The
mittee, after sitting in deliberation for nearly three
with closed doors, have presented to the House a re
stating that the working of the Gas Act of 1860
totally failed; that the illuminating power and q
of gas is better in the provincial towns than it
the metropolis, and the price cheaper to the consu
that the purification of gas in the metropolis is impe
and an excess of sulphur remains, highly injur
pictures, leather, &c.; that the result of the pa
the Act 1860 was to increase the price of gas to
public. They recommend that the illuminating p
should be increased and its purity improved, and th
chemical board of three members, to be appointed by
Secretary of State, should regulate the purity of
gas, and appoint testing places; that the gas comp
should not be at liberty to make up former de
dividends out of future profits, and that losses to the
companies through neglect of their works should not
upon the consumers, as in the case of the Wood-

, where £25,000, instead of being taken from the reholders, was taken from the consumers by the at Central Gas Company. They find that the mode ecovering penalties against gas companies at present tally inoperative. And, lastly, whilst recommend- that the districting system should be continued with ew to economy, they are of opinion that the several ting companies should either be amalgamated or sferred to some public body in the metropolis on terms as Parliament may think fit to impose.— *iners' Chronicle.*

Colonies.

E INTERCOLONIAL EXHIBITION, which is to be opened elbourne in August, is attracting much attention in ensland, and preparations are being made for having colony fully represented. Among the principal imens that will be sent are gold, silver, copper and r ores, coal, marble, wood, granite, &c. The gold s of the north are gradually becoming more produc- and giving employment to a larger population. Peak Downs copper mines bid fair to rival some of ich mines of South Australia. There are extensive measures in Queensland, and large quantities of ably good coal have been produced from a short below the surface. Fine granite has been obtained site of the new waterworks reservoir at Enoggera, ome specimens of a hard description of stone, ad- ly suited for building purposes, have been found ranges on the Brisbane side of Enoggera. Marble f quality has been discovered at Gladstone. The facturing industry of Queensland will also be fully ented. South Australia, almost the only colony has failed to take up the proposal of the Victorian ament, has at last entered the lists and adopted eliminary steps to secure a representation of the ts of that colony at the Exhibition. At Ballarat rt is being made to have a local exhibition of the butions of that district before they are forwarded bourne. The same thing is being done in South Land. In New South Wales the initiatory step s to have been taken by the municipality of n, the mayor of that place having responded to dress forwarded by the Melbourne Commissioners ving promises of hearty co-operation in that dis- The Exhibition Commissioners are endeavouring tain the co-operation of the neighbouring colonies preparation of a series of tabulated statistics, with to the ultimate collection and a collation of the —a scheme which, if properly carried out, will a most valuable and exhaustive record of com- ive statistics; with this idea is that of the prepa- of vocabularies.

IMPORTS AT PORT ADELAIDE from the beginning year to March 17, were valued at £560,157, and ports at £584,771. The Customs receipts for the period were £56,262, and the total quantity of land y Government realised £101,279.

GRASS TREE IN AUSTRALIA.—The grass tree horea) is to be found in nearly all parts of lia, but up to a recent period it was supposed only useless growth. Experiments have recently been however, with the root, which usually weighs 10lb. to 50lb. From the outer portion of the root hellac in large quantities is said to be obtainable; fuse contains a large quantity of gas, which can be available for lighting the works. From the inner n is extracted a spirit said to be equal to the best y. After distilling, a quantity of saccharine matter s, from which sugar can be extracted. The supply tree appears to be almost unlimited.

LAND ISLES.—Besides the anthracite coal pre- y discovered, a fine quality of bituminous coal een found. The English Government have ined on fortifying the Islands.

Obituary.

LEON LOUIS NICOLAS JALEY, sculptor, born in Paris in 1802. He entered the Ecole des Beaux Arts in 1820, won the grand prize of Rome in 1827, received four medals and the cross of the Legion of Honour between 1833 and 1837, and in 1856 he was elected a member of the Academy of the Fine Arts in the Institute of France in the place of the late David d'Angers. Several statues and busts by Jaley are in the galleries of the Luxembourg and of Versailles.

Notes.

IRON IN SUGAR.—Mr. Rodwell, F.C.S., in a letter to the editor of *Travers's Circular*, says:—"Numerous complaints are being made at the present time in regard to the black colour which is communicated to tea by various kinds of moist brown sugar. From this fact, it is supposed that the sugar contains some deleterious substance added to it during the process of manufacture, but this is not the case. The fact is, the colour is produced by the presence of a minute quantity of iron in the sugar, which enters into combination with the tannic acid, always existing in tea, and forms the intensely black compound, tannate of iron. In the sugar refinery syrups are frequently passed through iron pipes, received in iron cisterns, crystallized in iron moulds, and drained into iron pots; in these various processes small quantities of iron are dissolved by the acid of the sugar, and are rapidly diffused through the entire mass; while one portion passes into the treacle, another is retained by the sugar, and is the cause of the effects mentioned above. It is needless for me to remark that the trace of iron in sugar exercises no pernicious effect upon the system; it is rather wholesome than otherwise."

MUSEUM OF THE ANTIQUITIES OF PARIS.—It is reported that a museum is about to be established in the Hôtel de Ville, to contain all objects of interest connected with the history of the city; an excellent idea, which it is hoped may be carried out, and thus establish a precedent for collections of the same kind in other great capitals and cities where so many matters of interest lie concealed beneath the dust of the past, and in the crowded haunts of the present day. The municipal authorities of Paris possess already the nucleus of such a museum; they purchased, in 1856, the very curious collection of historic badges and ornaments in lead, made by M. Forgeau, from the dredging of the Seine; and they have just purchased two pictures by Raguenet, lately belonging to M. Boittelle, formerly prefect of police, one representing the Hôtel de Ville as it was in the year 1751, and the other being a view of the Tuileries two years later. It is said to be the intention of the authorities to purchase the collection of medals and antiquities relating to ancient Paris, made by M. Legras. It is a pity that such a museum was not commenced ten years since, for the demolitions which have been made in Paris have yielded a rich harvest to collectors; but there is no doubt that masses of curiosities are still to be found, and many now in private hands will, no doubt, soon find their way to the Hôtel de Ville when a suitable gallery is prepared for them. Those who are not impressed with the interest and real value attaching to such collections as that now proposed to be made for the city of Paris, should pay a visit to the Museum of the City of Rouen, certainly one of the most admirable that has been established during the present century. It was true that Rouen was peculiarly rich in historical curiosities and memorabilia, but the wealth which is contained in such capitals as Paris or London is unknown until a fitting place is prepared for their reception. Our gallery of historic portraits shows what treasures of historic art may be col-

lected in a few years; and the memorials of past times are to be found in every street, lane, and corner of an ancient town. The Prefecture of the Seine will find little difficulty in the formation of an interesting collection. The authorities of London have only to follow the example, and the Museum of the City of London would soon be one of the lions of the metropolis.

MEETINGS FOR THE ENSUING WEEK.

MON......British Architects, 8.
R. United Service Inst., 8½. "Collisions at Sea, and their remedy by means of an improved system of lights." Adjourned discussion on a paper by Commander J. A. Heathcote, late H.M. Indian Navy.

TUES. ...Statistical, 8. The Duke of Argyll, "On the economic condition of the Highlands of Scotland."
Anthropological, 8.
R. Horticultural, 3. Mr. Bateman, "On Fremontia Californica, and other plants."

WED. ...Meteorological, 7. Annual Meeting.
Geological, 8. 1. Mr. S. V. Wood, "On the structure of the red crag." 2. Mr. H. W. Bristow, "On supposed remains of crag on the North Downs, near Folkstone." 3. Rev. O. Fisher, "On the 'warp' of Mr. Trimmer; its age and probable connexion with the latest geological events." 4. Mr. Salter, "On faults in the drift gravel at Hitchin, Herts." 5. Mr. J. W. Flower, "On some flint implements from the Little Ouse, near Thetford." 6. Mr. R. J. L. Guppy, "On the relations of the tertiary formations of the West Indies." 7. Dr. J. Young, "Notice of new genera of carboniferous Glyptodipterines." 8. Dr. Young, "On the systematic position of *Chondrosteus*." 9. Lieut.-Col. Neale, "On the discovery of new gold deposits in the district of Esmeraldas, Ecuador." Communicated by the Foreign Office. 10. Mr. J. S. Wilson, "On the geology of the Pacific coast of Ecuador." Communicated by Sir R. I. Murchison. 11. Mr. A. Leith Adams, "On the discovery of remains of *Halitherium* in the miocene beds of Malta." 12. Mr. A. Leith Adams, "On bones of fossil Chelonians from the ossiferous caves and fissures of Malta."
R. Society of Literature, 4½.

THUR. ...Zoological, 4.
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Dr. Welwitsch, "*Sertum Benguelense*." 2. Dr. Sigerson, "On cortical cuneate rays." 3. Messrs. R. L Guppy and Jabez Hogg, "On the lingual dentition of some West Indian *Gasteropoda*." 4. Mr. Thomas Edward, "Notes on some of the smaller crustaceans."
Chemical, 8. 1. Messrs. Crace Calvert and Johnson, "Action of acids on metals and alloys." 2. Dr. Debus, "Constitution of some carbon compounds."
Numismatic, 7. Annual Meeting.
Philosophical Club, 6.

SAT ......R. Botanic, 3½.

Patents.

From Commissioners of Patents' Journal, June 8th.

GRANTS OF PROVISIONAL PROTECTION.

Albums for photographs—1473—C. McFarland.
Bedsteads, &c., metallic—1427—J. Tombs.
Boiler furnaces—621—J. D. Dow.
Candles, adaptable ends for—1420—J. L. and J. K. Field.
Carriages, doors for—1413—P. Devilliard and A. Postweiler.
Cast-iron, treating—1430—J. Livesey.
Clod-crusher—1443—I. James.
Combustible and inextinguishable compound—1411—J. Sharp and R. Smith.
Composition for journal boxes or bearings—1485—J. H. Johnson.
Concrete, mixing—1435—P. J. Messent.
Condensing apparatus—1406—P. Vandirbyl.
Cotton-gins—1397—G. Macdonald.
Cotton, &c., compressing and packing—1434—J. T. Wood.
Doors, &c., stop-centre for—1465—J. W. Hoffman.
Engines, motive-power—1451—S. Douglas.
Engines, motive-power—1401—J. Bernard.
Engines, rotary—1402—J. Beale.
Engines, rotary—1461—W. H. C. Voss.
Fencing hurdles, wrought-iron—1505—W. Bayliss, jun.
Files, machinery for cutting—1507—G. T. Bousfield.
Fire-alarms, self-acting—1376—J. H. Johnson.
Fire-arms, breech-loading—1396—W. E. Newton.
Fire-arms, breech-loading—1501—W. R. Pape.
Fire-arms, extracting cartridges from—1489—T. Woodward and G. Fallows.
Fuel, purification of—1471—J. D. Whelpley and J. J. Storer.
Furnaces—1354—T. Wimpenny.
Furnaces—1398—J. Hampton.
Greenhouses—1399—T. H. P. Dennis.
Heat, non-conducting substances for impeding passage of—1327—J. A. Jones.
Hemp, &c., preparing and spinning—1426—H. B. Barlow.
India-rubber, machinery for cutting—1431—J. M. Dunlop.
Infants' feeding bottles—1409—P. J. Morand.
Lath-cutting machinery—1418—J. Brown.
Light and heat, obtaining from liquids—1320—J. L. Norton and A. Giles.
Locks, connecting handles to—1352—J. M. Hart.
Looms—1335—D. Bowden and R. C. Stephenson.
Looms—1429—W. Gadd and J. Moore.
Looms, self-acting temples for—1269—T., J., J., and N. Bleasd.
Lubricating compounds—1432—A. B. Blackburn.
Marine steam-engines and surface condensers—1433—A. Crichton.
Metal, raising and stamping—1405—D. J. Fleetwood.
Metals, moulds for casting—1479—R. Canham.
Metals, rolls for rolling—1477—C. T. Hill.
Metallic acetates and carbonates—1332—R. Rowland.
Metallic barrels—1374—W. E. Newton.
Metallic wires, connecting—1503—W. E. Newton.
Motive power—1422—M. Semple.
Mouldings, preparing and fluting—1407—R. Gesell and A. Lea.
Mowing machines—1414—W. Bunger.
Mowing machines—1424—J. B. Brown.
Musical instruments, percussive—1220—J. H. Johnson.
Ornamental fabrics, weaving—1455—J. and R. Cunningham.
Perfumes, apparatus for scattering—1412—J. W. Fox.
Pipes and tubes, joining—1351—W. Austin.
Pumps 1475—D Thomson and W. Porter.
Rails, securing—1421—G. J. Vincent.
Railway trains, signalling between passengers and guard—[illegible] W. J. Blinkhorn.
Railways, supporting rails of—1481—G. Spencer.
Sewing machines—1270—W. B. Bartram.
Silk-dressing machinery—1452—T. Greenwood.
Slag, extracting copper or iron from—1403—J. Thomas & A. P[illegible]
Slags, &c., treatment of—1442—J. J. Marcais.
Spinning frames—1463—T. Blain.
Steam-boilers—1457—T. Green.
Steam-boilers, removing incrustation from—1496—G. Haseltine.
Steam-boilers, supplying with water—1487—G. Davies.
Steam-engines, rotary—1441—A. V. Newton.
Steam-ships, propelling and steering—1415—R. Griffiths and [illegible] Rigg, jun.
Taps—1419—H. Wilson.
Textile fabrics, manufacturing—1428—A. Casse.
Textile fabrics, drying and calendering—1450—J. Longbottom and J. Eastwood.
Textile materials, preparing and cleaning—1444—W. Rowe.
Tobacco-pipes—1453—W. Snell.
Washing machines—1423—N. Walton.
Water, instrument for measuring depth of—1404—W. E. [illegible]
Weaving, heddles and healds for—1436—J. McLintock.
Weaving, reeds for—1425—J. D. Ramsden.
Yarns, dyeing—1440—W. E. Newton.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Hoes, trowels, &c.—1550—N. Brand.
Tanning—1518—G. T. Bousfield.

PATENTS SEALED.

3191. J. Townsend.	3230. A. Guye.
3193. J. T. Griffin.	3237. J. Masson.
3202. C. Easby.	3242. H. G. Fairburn.
3206. A. Budenberg.	3243. W. Robinson.
3217. J. H. Smith.	3259. J. A. Longridge.
3218. F. B. Doering.	3265. C. Liddell & R. S. [illegible]
3219. A. S. Brooman.	3289. T. Rickett.
3220. H. F. McKillop.	3306. G. Hawksley.
3221. B. Porritt & W. Priestley.	3311. L. D'Aubreville.
3222. W. Brookes.	3385. W. F. Cochrane.
3223. G., E., and A. A. Atkin.	948. C. A. Shaw.
3224. J. Sanderson.	1036. G. Haseltine.
3228. H. Prowse.	

From Commissioners of Patents' Journal, June 12th.

PATENTS SEALED.

3231. W. Winter.	3343. J. Bean and G. G[illegible]man.
3235. J. C. Wilson.	3362. W. Harrison and T. [illegible]
3247. G. Warriner.	3367. J. R. Napier and W. [illegible] Rankine.
3250. C. Blyth.	31. W. E. Newton.
3253. R. Ransford.	47. W. Clark.
3254. R. Badger.	188. W. E. Newton.
3256. C. Pengilly.	202. W. Jeffries.
3257. F. Johnston & W. Astley.	228. M. Silvester.
3275. C. A. McEvoy.	500. W. and J. W. West.
3276. W. Creasy.	
3280. L. Durand.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1490. J. Shand.	1439. H. Bessemer.
2151. A. V. Newton.	1471. T. C. March.
1426. J. Petrie.	1530. R. Jobson.
1498. R. W. Gordon.	1455. C. L. Van Tenac.
1412. N. Walton.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1383. J. Ferrabee.	1407. M. J. Haines.
1384. W. Green.	1425. A. Smith.
1395. C. De Bergue.	

Journal of the Society of Arts.

FRIDAY, JUNE 22, 1866.

Announcements by the Council.

Financial Statement.

The following statement is published in this week's *Journal*, in accordance with sec. 42 of the Society's bye-laws, which provides that, at the annual general meeting, the Council shall render to the Society a full account of their proceedings, and of the receipts, payments, and expenditure during the past year; and a copy of such statement shall be published in the *Journal* of the Society on the Friday before such general meeting.

TREASURERS' STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE, FOR THE YEAR ENDING 31st MAY, 1866.

Dr.

	£	s.	d.	£	s.	d.
Cash in hands of Messrs. Coutts and Co., 31st May, 1865				295	8	10
To Subscriptions for the year, from Members and Institutions in Union				5,658	15	6
Life Contributions				207	18	0
Donation by A. Davis, Esq., to be awarded as a prize				21	0	0
Dividends on Stock :—						
Consols:—						
Swiney Bequest £4,500 0 0						
John Stock's Trust ... 100 0 0						
Invested by the Society 146 19 5						
£4,746 19 5	140	0	10			
New 3 per Cents. (Fothergill's Trust) 388 1 4	11	9	0			
52,000 Rupees, 5 per Cent. Rupee Paper	257	6	6			
				408	16	4
To North London Exhibition Trust				150	0	0
Dividend on Consols (£167 7s. 3d.), held in trust for above				2	9	4
Advance by Messrs. Coutts and Co.				1,300	0	0
To Examinations:—						
Prince Consort's Prize				26	5	0
Sir C. Wentworth Dilke, Bart., M.P.	8	0	0			
Rev. Dr. Temple	5	5	0			
Harry Chester, Esq.	3	0	0			
Charles Brooke, Esq., F.R.S.	2	2	0			
Dr. Skey	1	1	0			
Royal Horticultural Society	5	0	0			
Fees from Candidates	4	2	0			
				28	10	0
To Mosaic Picture Fund, subscription repaid	106	0	0			
Sale of Books	14	7	1			
Jury Reports	55	14	0			
Art-Workmanship Examples	8	3	6			
Society's Memorial to the Prince Consort	1	1	0			
				185	5	7
South Australian Institute				650	0	0
				£8,934	8	7

Cr.

	£	s.	d.	£	s.	d.
By Rent, Rates, and Taxes	193	8	5			
Insurance, Gas, Coals, and House Charges	223	15	11			
Salaries, Wages, and Commissions	1,703	15	9			
Stationery and Printing	239	3	5			
Postage Stamps and Parcels	125	13	0			
Advertising	127	5	4			
Advance by Messrs. Coutts and Co., repaid	1,300	0	0			
Interest on ditto	42	11	2			
Journal, including Stamps and Distribution to Members	1,089	19	6			
Union of Institutions, including Examinations, Prizes, Postage, Stationery, Printing, &c.	687	5	6			
Prince Consort's Prize	26	5	0			
Conversazione	155	14	8			
Repairs and Alterations	131	0	2			
Jury Reports on Exhibition, 1862	24	8	1			
Art-Workmanship Prizes	84	9	10			
Society's Albert Memorial Medal	189	19	0			
,, Medals	6	0	0			
Library, Bookbinding, &c.	84	1	1			
Annuity to Mrs. Canter	25	0	0			
Cantor Lectures	207	8	9			
Musical Committee	25	1	4			
Society's Memorial to the Prince Consort	679	17	2			
Labourers' Dwellings Committee	132	18	0			
North London Exhibition Trust, invested in Consols (£167 7s. 3d.)	150	0	0			
South Australian Institute	639	10	0			
				8,294	11	1
Balance of Cash in hands of Messrs. Coutts and Co.				639	17	6
				£8,934	8	7

Liabilities and Assets.

Dr.

	£	s.	d.	£	s.	d.
To Sundry Creditors:—						
South Australian Institute	194	11	6			
Sir W. C. Trevelyan, Bart.	70	0	0			
The Prince Consort's Prize	26	5	0			
Examination Prizes	204	0	0			
Examiners' Fees	220	10	0			
Art-Workmanship Prizes	174	0	0			
Harry Chester, Esq.	1	0	0			
Donation by A. Davis, Esq., to be awarded as a prize	21	0	0			
North London Exhibition Trust	2	9	4			
Tradesmen's Accounts	751	4	5			
				1,665	0	3
Excess of assets over liabilities				6,414	3	5
				£8,079	3	8

Cr.

	£	s.	d.	£	s.	d.
By Consols, £146 19s. 5d., at 87⅞				128	17	7
Invested in Indian 5 per Cent. Rupee Paper				355	2	7
Subscriptions due and in course of collection, £2,265 18s., valued at				1,811	11	0
Estimated Value of the Society's Lease of Premises				3,000	0	0
,, Other Property				2,000	0	0
Prince Consort's Prize				26	5	0
Royal Horticultural Society				19	0	0
Worshipful Company of Salters				10	10	0
,, ,, Plasterers				15	0	0
Fees due from Examination Candidates				3	0	0
Cash in hands of Messrs. Coutts and Co.	639	17	6			
,, London and Westminster Bank	70	0	0			
				709	17	6
				£8,079	3	8

Invested Trust Funds.

	£	s.	d.	
Swiney Bequest	£4,500	0	0	Consols, chargeable with a sum of £200 once in five years.
John Stock's Trust	100	0	0	,, chargeable with the Award of a Medal.
North London Exhibition Trust	150	0	0	,, chargeable with the Award of the Interest as a Money Prize.
Fothergill's Trust	388	1	4	New 3 per cents., chargeable with the Award of a Medal.
Cantor Bequest	5,049	9	7	Invested in Indian 5 per cent. Rupee Paper.

Society's House, Adelphi,
June 20th, 1866.

W. T. MACKRELL, *Auditor.*
P. LE NEVE FOSTER, *Secretary.*

Annual General Meeting.

The One Hundred and Twelfth Annual General Meeting, for the purpose of receiving the Council's report and the Treasurers' statement of receipts, payments, and expenditure during the past year, and also for the election of officers, will be held, in accordance with the bye-laws, on Wednesday, the 27th of June, at four o'clock p.m.

The Council hereby convene a Special General Meeting of the members of the Society to ballot for members, such meeting to take place at the close of the Annual General Meeting.

By order,
P. Le Neve Foster, *Secretary*.

Society's House, Adelphi, June 20th, 1866.

Institutions.

The following Institution has been received into Union since the last announcement:—

Colchester Literary Institution.

Proceedings of the Society.

Fifteenth Annual Conference.

The Fifteenth Annual Conference of the Representatives of the Institutions in Union, and the Local Educational Boards, with the Council of the Society, was held at the Society's House on Wednesday, the 13th inst., at 12 o'clock noon. William Hawes, Esq., F.G.S., Chairman of the Council, presided.

At the conclusion of the Society's Report to the Council, read to the Conference, and published in the last number of the *Journal* (page 513)—

The Chairman said that with regard to the Final Examinations, they must not be discouraged by the fact of the number of candidates being somewhat less this year especially in London. This might, possibly, arise from the fact that a large number of working men and clerks who had hitherto resided in the metropolis itself were now, by various circumstances, obliged to live at greater distances, and the machinery did not yet exist by which they could be supplied at their present residences with the same educational facilities they formerly had. He would not venture to assert that this was so, but he suggested it as a possible explanation. With regard to the country, in one instance the loss of an active and valuable superintendent and visitor might in some degree account for the deficiency in that particular locality, though he must frankly say he did not feel that this sufficiently accounted for the falling-off. Under the circumstances it became them all to use more active and untiring efforts to recover the lost ground, and to extend the benefits of these examinations as widely as possible. Mr. Sales, one of the Society's visiting officers, had stated, in his report, that they must not expect a continued increase in the London districts. He (the Chairman) would have thought that as the advantages of the certificates were more understood and appreciated, the tendency would have been towards a steady annual increase; but no doubt Mr. Sales had good reasons f[or] the statement he had made, or he would not have ve[n]tured upon it, and they might hear more on the subj[ect] in the course of the proceedings that were to foll[ow]. He would briefly refer to some of the subjects wh[ich] were to be brought before the conference. The fi[rst] was—"Whether the Society of Arts should continu[e to] furnish elementary papers to Unions and Local Boa[rds,] or whether it would be better for the Society to conf[ine] its attention exclusively to the Final Examinatio[ns."] He believed the experience of those who superinte[nded] the working of the district Unions was that a preju[di]cial effect had been exerted on the Final Examination[s in] consequence of the Society issuing the forms of certifi[cate] for the elementary examinations, they having, in m[any] instances, been put forth as those of the Society of A[rts.] While it was desirable to do all they could to encou[rage] elementary examinations, it certainly was not desir[able] that the certificates given for mere elementary knowle[dge] should be mistaken for, or confounded with, the cer[tifi]cates given in the Final Examinations. His own [im]pression was, therefore, that it would be better to [dis]continue the issue of forms of certificate for element[ary] examinations, and that the Society should confine i[t]simply to providing the papers for those examinati[ons,] leaving it to the Unions and Local Boards to pre[pare] and grant the certificates; those certificates could [not] then be mistaken for the certificates issued by [the] Society. Another subject on the list was—"What m[eans] can be adopted to secure a greater number of female ca[ndi]dates at the elementary examinations?" They had h[eard] from the report that there had been an increase, [and] he thought that if the Unions were to do t[heir] utmost by offering special prizes to induce the fe[male] portion of the population to come forward in the [ex]aminations, good results would follow. The n[ext] question was, "Whether the great City companies, [and] other analogous bodies, might not be invited to [co]operate with the Society in promoting the educati[on of] adults by special prizes for competition in subjects [with] which such companies are officially concerned, or a[mong] candidates connected therewith?" He was afraid [they] could do very little in that direction. Last year [the] Council endeavoured to enlist the sympathies of [the] great City companies in offering prizes for Art-w[ork]manship. A carefully-drawn circular was sent to the great guilds, soliciting their co-operation by offering a prize or a series of prizes for proficie[ncy in] the arts connected with their respective guilds. O[f] a total of ninety companies only two responded to [the] appeal, and those were companies which might [have] been thought least likely to do so, viz., the Pl[asterers] and Salters. The next subject, the obtaining the [co]operation of other societies, as was the case with [the] Royal Horticultural Society, with a view to the b[etter] promotion of education among the various class[es of] working men, was very analogous to the preceding, and the same remarks applied to it. The next w[as a] very important question, viz., "Whether cheaper books could not be, in some cases, recommende[d to] candidates at the Final Examinations, or whether [some] means could be adopted for enabling them to have [ready] access to the more expensive ones." That was a [very] difficult question. He believed on most subjects [em]braced in the examinations there were cheap text b[ooks,] but there were two or three subjects, particul[arly] Political Economy, on which there did not appear [to be] any cheap text books to be had. If works of this [kind] could be obtained in an abridged or cheaper form the [So]ciety would be very glad to promote their publication. [The] seventh subject he need not touch upon, but in refer[ence] to the eighth subject he might mention that a cu[rious] fact had been communicated to him by a membe[r of] the Council (Mr. Maudslay) whose firm employ[ed a] large number of workmen. That gentleman stated [that] although a library of some thousands of volumes [had] been established by the men themselves, at a large co[st,]

he was surprised to find how little it was used by them, notwithstanding that it had been formed by the contributions of the men themselves, who also managed it, and elected their own committee. The same gentleman remarked upon the ignorance of the working classes of the true principles on which success in life depends, and referred to a remarkable fact with respect to trades unions, namely, that though wages were higher, yet the number of men out of employ was greater; and such was the nature of the combination amongst them, that they would rather maintain by their contributions those out of employ than allow the aggregate mass to work at a lower rate of wages. This was stated from Mr. Maudslay's personal knowledge; and he (the Chairman) thought it was a sad instance of the influence which a certain class of men were now exercising over others possessing less knowledge, and a lamentable proof of how men would "follow their leader" without looking to the effects upon their own personal interests. The next subject on the list to which he would refer was, as to the possibility of establishing museums of a simple character, to circulate throughout the country in connection with Institutions and evening schools, on the plan adopted by the Science and Art Department for Schools of Art. He thought that was a matter which must be left to that department. The remaining subjects on the paper he need not touch upon, but he would now invite discussion upon the first on the list, namely:—

The Scheme of Elementary Examinations:—Whether the Society of Arts should continue to furnish Elementary Papers to Unions and Local Boards, or whether it would be better for the Society to confine its attention exclusively to the Final Examinations?

Mr. H. H. Sales (Yorkshire Union of Institutes) said, before entering upon the first subject, there were one or two points in the report of the Secretary, and in the speech of the chairman, to which he begged to be allowed very briefly to refer. Looking to the report just read respecting the progress of the educational scheme, they must all have remarked the great success which had attended one particular institution, which year by year had held a very high position, not only in the number of its certificated students, but in the amount of prizes which it carried off. Every one who knew the working of the City of London College must feel that those who were connected with it had reason to be proud of the great success and the high position which it had attained amongst the educational institutions of the land; but the very fact of that great success, and its organization, approaching as it did as nearly as possible to that of a university, led them to ask whether it had not arrived at a position, not only as regarded its professional staff of instructors, and the high class of education it gave to its students, but also as regarded the social rank from which its students were drawn, which should remove it from the class of institutions for whose benefit the work of the Society was carried on. This year he was struck with the fact that a very large proportion of the prizes at the Final Examinations were carried off by the City of London College. He spoke quite impartially on this subject, and he referred to it only as it affected the other Institutions. He found almost without exception the description "clerk" attached to the names of the candidates from that college. It was difficult to define what the social position of a clerk was, but when they inquired into the parentage of the candidates they might sometimes arrive at data on which to judge whether they came from that class of the population which it was the purpose of this Society to assist in educational matters. One prizeholder he found was the son of a colonial broker. Another of a person of independent means, and a third of a large manufacturer. These facts acted, in his opinion, detrimentally to the objects for which the examinations were instituted. He could not say that it had had any appreciable effect in the decrease of the number of candidates this year, but he could not but think its influence would ultimately be to discourage persons from other Institutions, who really belonged to the classes of society that it was desired to aid, from coming forward in future years.

Mr. J. H. Levy, as the only representative of the City of London College present at that moment, felt called upon to make a few remarks upon what had just fallen from Mr. Sales. He took it that the prizes of the Society of Arts were offered to persons not professional students, but who gave the gleanings of their leisure time to the improvement of their education, and as such the students of the City of London College had as much right to compete for the prizes of the Society as those of any other Institution in union with it. Having been himself a student in that college, and knowing a large number of those who belonged to it, he was able to state for the most part what their position in life was. They were usually men employed in offices and warehouses in the City, and receiving salaries of £80 to £150 a year: and as a test of pecuniary means he might advert to the fact that a short time ago, when the College was in straightened circumstances, it was proposed to increase the terms of subscription one shilling per quarter, and although additional advantages were offered for the extra amount, it was found that this small sum was so great a consideration with a large number of the members that very many of them left, proving that their social status was not so high as the gentleman who had just spoken led the meeting to believe. With regard to the students of the College carrying off a great number of prizes, this was to be accounted for on different grounds to those which had been stated. It might be the fact that persons employed in offices and warehouses in the City had received an education perhaps superior to the ordinary run of mechanics and labourers: but he maintained that the work they did in the College was that which the Society intended to encourage by its prizes. Those young men, but for this and similar Institutions, would be wasting their time at places of public amusement, instead of occupying themselves in intellectual matters: and if they carried off a large number of prizes, he asked was that to be brought forward as a reason why they should be excluded from the competition? Were they to be punished for their success in their studies? If they examined into the social status of the members of the Polytechnic Institution and others in London they would be found to be very much of the same class as those of the City of London College. The real secret of the success of the latter Institution consisted in the excellence of its organisation and the way in which its business was carried on. In those respects he believed they could challenge most Institutions, and by that means they were pretty sure of carrying off a large number of prizes. He thought it would be a great act of injustice to punish an Institution because of its success in the work which the Society wished to encourage.

Mr. Harry Chester said this subject was a very important one, and he thought, after what had been said, it was desirable that the Local Board of the College should look carefully into its candidates to ascertain whether they were eligible to compete for the prizes. He had the honour of being himself a vice-president and one of the founders of that College, although he was not present in the character of a representative of it on this occasion, and he did not know exactly what had taken place with regard to the late examinations, having been a great deal out of town; but he wished to corroborate what had been stated by the last speaker, viz., that he was convinced a great deal of the success of that Institution in the examinations was due to its own merits. He believed the College was better constituted than any other of its kind in the United Kingdom, and the students were admirably taught by teachers who had been for the most part themselves trained in that College. The Polytechnic Institution had had great success this

year, and he believed the same influences prevailed there to a considerable extent. Do what they would, a well-managed college or Institution would carry off more prizes than one which was inferior in that respect; and if they said, because an Institution was uniformly successful in the examinations it should be excluded from the competition, they cut at the root of the success of all these Institutions.

Rev. R. Whittington (City of London College) regretted he was not present to hear the remarks of Mr. Sales. He was surprised to hear in the present day that the success of an educational institution should be made a ground of complaint against it. With regard to the social status of the candidates it was very difficult to draw the line. As to the pupils of the College he would say they were generally of that class from which in all large towns they expected to draw members for Mechanics' Institutions; but he might be allowed to add that they perhaps possessed superior advantages to many other Institutions in respect of the superiority of the educational staff.

Mr. Monk (Kent Association) inquired what were the terms of studentship in the College.

Mr. Whittington replied that they varied according to the class of instruction. The average might perhaps be taken at 6s. per quarter for each class. The fact was, as had been already stated by Mr. Levy, that when, with the desire to make the College self-supporting, they increased the subscription 1s. per quarter, they lost nearly one-third of the members, which proved that the bulk of the members were not in a position to pay any large sum for their instruction. He agreed with Mr. Levy and Mr. Chester that the great success of the College was the result of the method carried out there, and the power which existed of the division of classes according to the proficiency of the pupils in the various studies. He repeated that the majority of the members of the College were of the class who would belong to Mechanics' Institutions generally, and who could not afford to pay a higher rate for instruction, though there were some of higher social position. If there was any ground of complaint in respect of the social status of the prize-holders of the College, it rested with the Society itself, inasmuch as the names of the candidates for examination were sent in, and it was for them to judge whether a candidate ought to be rejected on the ground of social position and inferentially superior previous educational advantages.

Dr. Pankhurst (Lancashire and Cheshire Union of Institutes) remarked that the question introduced by Mr. Sales vitally affected the structure and organisation of the educational machinery of the Society of Arts, and he thought if anything was wanting to complete the objections which Mr. Sales had urged, it had been furnished in the remarks of Mr. Chester and Mr. Whittington. The statement of the latter gentleman, in describing the educational system of the College, went decidedly to show that a large number of the members were drawn from ranks of life higher than those constituting for the most part the members of Mechanics' Institutions. If they were to have fair competition in the examinations they must have something like equality in the social and educational advantages of the candidates. There was every reason for congratulating the City of London College on the status of its members, and its prominent position as an educational Institution, but, having so far distinguished themselves, let them go on to something higher—and not compete with the raw recruits from the country, while they themselves were well trained and disciplined soldiers. On every ground he would suggest that some limitations should be imposed upon the competition of such an Institution as the City of London College in the Society of Arts Examinations —not to punish them for their success, but to say to them, "Friend, go up higher."

The Chairman thought the question had arisen from an imperfect knowledge of the conditions imposed by the Society in this matter. In the preliminary notice of the Society's Programme, it was stated that the examinations "have been established for the benefit of the members and students of institutions in union with the Society of Arts. Such persons are commonly mechanics, artisans, soldiers, labourers, clerks, tradesmen, and farmers in a small way of business, apprentices, sons and daughters of tradesmen and farmers, assistants in shops, and others, of various occupations, who are not graduates, undergraduates, nor students of a University, nor following nor intending to follow a learned profession, nor enjoying nor having enjoyed a liberal education." Persons in a higher class of life than those were examined only on payment of a fee, and were not eligible for prizes. It was the duty of the Local Board to see that the persons who were sent up for prizes did not belong to the restricted classes. He had before him the names of the candidates to whom Mr. Sales had alluded, and it seemed to him unfair to put young men of that class in life in competition with the usual run of candidates for whom these examinations were established. Indeed, he was induced to think that the Local Board of the City of London College ought to have returned them as disqualified from competing for prizes, as this duty was imposed upon the Board in the programme.

Mr. Sales, having disavowed the slightest intention to make any attack upon the City of London College, stated that he had brought the matter forward entirely from a feeling that it had acted detrimentally to the work of the Society.

Lord Lyttleton (President South Staffordshire Association), reverting to the first subject for discussion, said, in the interest of local institutions he would be glad to receive as much assistance as possible from the Society, and he was decidedly in favour of the council continuing to furnish the papers for the elementary examinations.

The Chairman said he should be glad to hear the opinions of the representatives with regard to the suggestion that the Society should discontinue to issue the certificates for the elementary examinations.

Mr. Chester said it seemed to him very undesirable that the Society should cease to furnish uniform elementary papers, as well as forms of certificate. Those certificates, he thought, showed upon the face of them that these examinations were not conducted by the Society. So long as the certificate bore upon the face of it that it was granted by the local body, he thought no misapprehension could arise.

Mr. Holmes (Derby) remarked that the Local Board he represented would be sorry to lose the benefit of the elementary papers furnished by the Society. The candidates in his locality had been remarkably successful in the Final Examinations. Eleven candidates had worked twenty-one papers, and had gained the same number of certificates.

Mr. Barrow Rule (Aldershot and Farnham District) protested against any alteration of the existing system. At the present time he found a difficulty in getting persons even to look over the candidates' answers; it would be still more difficult to get persons to prepare the papers. Previously to the Society issuing the papers the duty of preparing them devolved upon himself and two or three other persons, and he found it a very heavy one.

Mr. Chester moved—

"That the Society of Arts should continue to furnish the elementary papers and the forms of certificate to be used by the Unions and Local Boards, but that such certificates should clearly purport to be issued on the authority of such Unions and Boards, and not on the authority of the Society of Arts."

Mr. Chester added that he thought all doubt would be removed by the certificate stating by whom the examination was conducted, and by whom the certificate was granted.

Mr. Barrow Rule seconded the resolution.

Mr. T. A. Reed (London Mechanics' Institution Local

Board) said that the only objection urged against the existing form was, that the introduction of the words "In Union with the Society of Arts," led persons to suppose that the certificate was given by the Society, but that objection would not be removed by the Society not furnishing the forms, because the Institutions themselves could, and probably would, continue to use the same expression.

Rev. Julius Lloyd (South Staffordshire Association) expressed himself favourable to the continuance of the preparation of the examination papers by the Society: but the body he represented thought the standard in the higher grade somewhat too high for candidates generally. He suggested that the subjects should be narrowed, and that the questions should be simpler, and he thought in other ways the examinations should be simplified. At present he considered the higher grade approached too near to the standard of the Society's final examination.

Mr. Alexander Craig (Glasgow Institution) having spoken in favour of the existing system of elementary examination papers,

Mr. Thos. Lawton (Lancashire and Cheshire Union) moved, as an amendment to Mr. Chester's resolution, that the society should continue to furnish the papers for the elementary examinations, leaving the district unions to record the success of the candidates by certificates or otherwise. He suggested that such certificates should be altogether a matter distinct from the Society of Arts, by which the object would be met, and all confusion prevented.

Mr. John Jackson (Bury St. Edmund's Athenæum and Local Board) seconded the amendment.

Mr. Sales thought, looking at the whole scheme of the elementary examinations, it would be found to be, notwithstanding the large number of candidates, a comparative failure. He did not depreciate the elementary examinations, but he thought that to be of any great benefit to the country they must be conducted on a much larger scale than hitherto. The number given of 1,814 candidates who presented themselves for examination this year was a mere speck compared with the number who ought to come forward. Why was this? He thought one reason was that these examinations came into competition with those of the government. They found that in the metropolis the elementary teaching was carried on principally in educational classes conducted in an ordinary day school under the supervision of the Government, the managers of which said, "Why should we have two examinations?" whilst moreover they got pecuniary aid from the government. He thought that was in some measure the cause why the number of elementary candidates in London had decreased. This would be found to be the case very much throughout the country. The government possessed facilities for these examinations which the Society had not: therefore these elementary examinations would not obtain results commensurate with the exertions of the Society on their behalf. As regarded the question of the form of certificate, it was immaterial what they put upon the certificates. If sent from the Society's house they would be regarded throughout the country as the "certificates of the Society of Arts," and the consequence would be that they would depreciate the value of the Society's real certificates. He thought that whilst the Society continued to give its attention to the final examinations, the elementary examinations should be conducted solely by the district unions. The Metropolitan Adult Association felt itself to be of sufficient importance to prepare and issue its own examination papers and certificates.

Mr. Chester protested against the statement that the elementary examinations in connexion with the Society were a failure, or that they competed with those of the Government. His own opinion was that there was room enough for both; they aimed at a different class from that examined by the Government, and he believed the work of the Society would continue, and that the interference of the Government with education would, in a few years, come to an end. The reason why the Society furnished the form of certificate was simply because they were requested to do so, and it was considered an advantage to have a uniform form of certificate throughout the country. The educational system established by the Society reached a class not provided for by the Government plan, and the evening schools in the metropolis complained, through the Metropolitan Adult Association, that the Government had not performed its promise of inspecting these schools, and giving the prizes which were to be the result of successful examinations. He hoped the Conference would be of opinion that it was desirable to have a centre of operations, and that the local districts in connexion with it should be as numerous as possible.

After a brief explanation from Mr. Sales, the amendment of Mr. Lawton having been withdrawn, the resolution proposed by Mr. Chester was agreed to.

The Chairman stated he was compelled to leave for a time, and requested Mr. Le Neve Foster, the Secretary, to occupy his place, when the Conference proceeded to the consideration of the next subject on the list, viz.—

Presuming the outline of the present scheme to be retained, whether any modifications in the details should be made, such, for instance, as

(a) To substitute the terms First and Second Divisions for "Higher and Lower Grades," and to award first, second and third class Certificates to Successful Candidates.

Mr. Monk proposed that the terms "first and second divisions" should be substituted for "higher and lower grades," which having been seconded by Mr. Holmes, a conversation ensued, in which a general opinion was expressed that the terms at present employed were the most appropriate, and Mr. Monk withdrew his resolution.

On the next head of the subject:—

(b) So to arrange the Time-table that the Examinations shall not clash with those of the Science and Art Department,

The Chairman suggested that was rather a matter for the Council than for the Conference, and stated that the Society's Examinations were necessarily fixed a twelvemonth beforehand, and in so doing the general convenience of the candidates was, as far as possible, consulted, and that course would be continued in future.

On the question:—

(c) That English Grammar be added to the List of Optional Subjects.

After some discussion on the advantages of the proposed addition to the subjects for Examination,

Mr. Heller proposed a resolution in the affirmative, which was seconded by Mr. Barrow Rule, and carried *nem. con.*

What Means can be adopted to secure a greater Number of Female Candidates at the Elementary Examinations?

Mr. Monk (Kent Association of Institutes) remarked that female education in this country was much neglected, and it was very desirable to increase the number of female candidates at the Examinations. Among the steps that were being taken by various societies to improve the condition of female education, the Kent Association had directed attention to the subject. In one small town in that county they had five female candidates for examination, who all acquitted themselves well, through the pains that were taken by the family of the vicar of the parish in teaching them. The programme of the Examinations, he said, was too extensive an affair to be placed in the hands of the female members of Institutions, and he suggested that an epitome should be prepared for their use, accompanied by a concise explanation of the plan of Examinations, and he concluded by

moving a resolution to that effect, which having been seconded by Mr. Pakington,

Mr. Lawton said this was a subject brought forward by him twelvemonths ago when he propounded a similar question to the conference then assembled. He thought this was a matter which the district unions themselves could best promote by offering prizes for females on special subjects in which they were more immediately interested. In his own district they had a considerable number of female candidates in the elementary examinations.

Mr. T. A. Reed (London Mechanics' Institution) thought they ought to encourage females for the higher examinations. In his own Institution female candidates passed with very fair success, not unfrequently gaining first-class certificates. He thought that system might be adopted in other Institutions, and it had been a marvel to him that the City of London College, with the great facilities it possessed, had done nothing for female education.

Mr. Whittington said there was not room for the students they now had.

Mr. Pakington was impressed with the importance of attracting the female members of institutions to studies which would be useful to them in the practical duties of life. In his own union a prize was offered for the best examination upon a very useful work, "The Finchley Manual of Domestic Management," which attracted no fewer than twenty-four candidates, and the papers were all so good that the examiners had very great difficulty in awarding the prizes. He thought this was a matter which the visiting officers of the Society might be able to promote.

Dr. Pankhurst believed the discussion of this subject would be attended with benefit. It seemed to him that these examinations depended upon two circumstances—first, a conviction of their utility; and next, the creation of public opinion in their favour. At the last meeting of the convocation of the London University, this subject was considerably discussed, and a series of resolutions were passed enunciating the principles on which it was proposed to construct a system of examination for young females. It was the duty of society at large to do what they could to develope the intellectual life of the rising female community, and to afford them the means of exercising their mental faculties in a sphere of independent and true activity. That was a work in which he believed the Society of Arts and the district unions could do a great deal, and he was also glad that the subject had been taken up by the University of Cambridge; if this Society took up the same object, addressing itself to a different class of society, a great stimulus would be given to female education.

Mr. Holmes said it was the feeling of the board he represented that some alteration should be made in the present regulations, so as to admit female pupil-teachers to compete for prizes. There was a fair proportion of female candidates in his district, but the numbers would have been greater if the pupil-teachers had not been excluded from competing for the prizes. He had been requested to ask whether that restriction could not be rescinded as regarded female pupil-teachers in the National Schools.

Mr. S. Redgrave thought the advantages of the examinations might be extended to females by the co-operation of ladies' committees in the several districts, from whom examiners might be selected; as they knew how unwilling young females were to submit their papers to men as examiners, and to being placed in competition with the male students of the Institutions.

Mr. Chester said it was no doubt very desirable to extend the system among the female portion of the community; but with regard to the suggestion of ladies' committees he agreed with the late Bishop of London, who said, "Do not have a ladies' committee if you can help it; but if you must have one, give them nothing to do!" Local Boards might no doubt be able to interest the ladies of their locality for the benefit of their sex i a class of life below them. The Princess of Wales h given a special prize for women connected with t Metropolitan Association.

Lord Lyttelton believed it was because there was difference made in the examinations of male and fem candidates that there were not more of the latter. T University of Cambridge made a broad distinction b tween the examination of women and men; it did n apply the same stimulus of competition to women a men, and did not publish the list in the order of m He thought it would be well to consider whether so special system of examination for women could not introduced.

Mr. Chester said some years ago a suggestion w made to form local boards of ladies for the examinati of female candidates, but it came to nothing.

Mr. Sales thought the best way to interest females the examinations was to establish special prizes for fem candidates only. The prize given by the Princess Wales had produced the best results. The spec examinations for females in the Cambridge Mid Class system had been very successful, and he thou that was a plan which the Society would do well imitate.

Mr. Lawton remarked that the importance of question must be admitted on all hands. In order bring in female candidates for the examinations t must make the subjects as attractive and as practic useful as possible, not restricting the education to me acquirements only but extending it to the practical p poses of life. To make them good housewives and to struct them in domestic economy was the great objec female education. The intellectual attainments mu accompanied with a proper knowledge of those th which tended to make a man's home comfortable which had so great an influence upon social England.

Mr. Monk said his only object was to bring this ject under the consideration of the Conference. He no doubt the views which had been expressed would considered by the Council, and in the hope that would take the subject into consideration he would w draw his resolution.

Whether the great City Companies and other A logous bodies might not be invited to co-ope with the Society in Promoting the Education Adults by Special Prizes for Competition in S jects with which such Companies are officia concerned, or among Candidates connected the with?

Whether the co-operation which already ex between this Society and the Royal Horticult Society for the Promotion of Education a Gardeners, might not be extended to other cieties, with a view to the better Promotion Education among other classes of Working M

Mr. Chester said it was at his instigation that two subjects had been placed on the list, and suggested that they should be considered toge The Chairman of the Council had thrown cold wa the idea that they could obtain the co-operation of City Companies, but he did not agree with the concl at which he had arrived. The examinations had tended over a period of eleven years, and he thought time was now come to make a vigorous effort to gi broader basis to their proceedings. The year before his suggestion of an appeal to the Royal Horticult Society was responded to by the offer on the part of body of special prizes, and the results had been s factory. He thought the examinations would s more rapidly, and that the whole scheme would be m effective if they could interest the public bodies of country in this work in connection with the Soci The Royal Horticultural Society having shown su

terest in the matter, they might fairly invite the Royal Agricultural Society and other bodies of that kind to do the same: and he believed the great City Companies would do so if application were made to them in a proper way. Looking through the list of successful candidates in the examinations they found persons connected with almost every branch of trade and manufacture, and the great companies connected with those trades and manufactures might be asked to contribute special prizes in the branches to which they were nominally attached. He therefore begged to move that the questions Nos. 4 and 5 be answered in the affirmative.

Mr. S. Redgrave had great pleasure in seconding the resolution. He thought they had hardly done enough to tempt the great City Companies to join them.

After a few remarks from Mr. Noldwritt (Walworth Institution) in support of the same, the resolution was adopted.

Whether Cheaper Text-books could not be in some cases recommended to Candidates at the Final Examinations, or whether any means could be adopted for enabling them to have ready access to the more expensive ones?

Mr. Sales said this subject was brought before the committee meeting of the Yorkshire Union, as, in some of the country districts, great difficulty was experienced in obtaining the necessary text-books for the study of the prescribed subjects for the Examinations, owing to their very high price. It occurred to him that in London and large towns the Institutions might co-operate to establish libraries of reference available for certain districts, where a dozen or twenty copies of the more expensive standard works could be deposited for the use of the students, which might be in some cases loaned to them for a certain period at their own homes. The discount of 27½ per cent., which was obtained through the medium of the Society, was of great importance in the purchase of such works. He thought the funds of Institutions could not be better appropriated than in contributing to the purchase of text-books.

Dr. Pankhurst suggested that perhaps the Society could induce men eminent in science and literature to prepare abridged editions of the great standard works in the several branches of knowledge, so as to bring them within reach of the humblest student; for it was lamentable to see that while physical science made such progress, it was very long before the latest and best theories were represented in the ordinary educational text-books. It was of the first importance that the text-books should closely follow upon the true progress of science.

Mr. Lawton corroborated the statement of Mr. Sales as to the difficulty of candidates procuring good text-books. Ninety per cent. of the standard works were beyond the reach of the working classes, and many Institutions had no funds from which they could provide these books. He thought no text book should be named as a *sine quâ non* which was above the average reach of the working classes.

Various suggestions having been made by several representatives,

Mr. Chester said he questioned the expediency of establishing lending libraries of text-books, for he thought it desirable that the student should, if possible, have them of his own. He was inclined to favour the suggestion of abridgments of the standard works being prepared with due care. In the meantime the Council would be happy to have communicated to them any suggestion by which this object could be forwarded; and they would give the subject their best consideration.

Whether it would be Desirable for the Council to Endeavour to Interest the Clergy, Gentry, and Others in Country Districts, in the Society's Scheme of Examinations, by issuing an Explanatory Address, and Directing Attention to the Existence of Local Educational Boards?

Mr. Jackson said in the agricultural district (Bury St. Edmunds) in which he resided there was great difficulty in exciting an interest in the examinations, and there was an absence of that desire for self-improvement on the part of the labouring class which existed in the manufacturing districts. In the town of Bury St. Edmunds the Institution which had been in existence several years was almost an entire failure, and though classes were founded they could not retain the students long enough to be of service to them. The Local Board which he represented was indebted to Mr. Chester for his personal explanation of the Society's educational system at a public meeting held in the town, but in spite of all that had been done he was sorry to say there was still a great apathy on the part of the population generally in reference to this subject, and he thought if some step could be taken to stir up general interest in the examinations, by issuing an address, or otherwise, it would be desirable.

Mr. Pakington remarked that the support given by the public to the Mechanics' Institution was of a very uncertain character. In the Worcestershire Union he thought the interest in these institutions was flagging, and a carefully drawn explanatory address was printed and issued to those of the public from whom support might have been looked for; all the return they got was one copy sent back through the dead-letter office; it produced no pecuniary results whatever.

Mr. Lawton mentioned that the plan adopted in his (South Staffordshire) Union, was, when the Society's programme was issued, to prepare a large sheet containing the chief points of interest in it, which was hung up in the class-rooms of the institutions.

Mr. Barrow Rule had little faith in letter-writing by way of appeal for support. The labour exceeded the result produced. He had greater hopes from the exercise of private influence.

Mr. Levy remarked that something more than temporary assistance was required; what was wanted was for the principal residents in the neighbourhood to show a permanent interest in the institutions by becoming patrons, vice-presidents, &c., of them, and opening their purse-strings liberally.

Mr. Sales considered that the best way of bringing the operations of the Society before the public was by holding meetings in the several localities. An appeal by circular was of little value as compared with what a good public meeting could do. He thought the practical reply to the representative from Suffolk with regard to the failing interest was that there was no "district union." His advice was that they should unite together, as was done in other counties, with a view of affording each other mutual assistance, and interesting a greater number of persons in this educational work than could be reached by mere isolated efforts.

The next subject was:—

How far Employers in London and other large Towns can be induced to aid the Educational Scheme, by giving to Young Men in their Employ Special Encouragement to join the Institution Classes?

The Rev. R. Whittington said one of the greatest difficulties he had to contend with in the metropolis was not only want of encouragement, but in some cases actual opposition on the part of employers of young men to their joining the classes of educational institutions. On the other hand, there were many bright exceptions to this. At the commencement of these examinations the Society put forth a paper containing the signatures of a number of eminent men, statesmen and others, including men of high standing in the commerce and manufactures of the country, declaring that the certificates of the Society had a value in their estimation. There was great difficulty in keeping the young men in the institutions,

because some of the employers were jealous of their obtaining that education which would justify them in asking for higher salaries, in consequence of their having become more valuable servants through the knowledge they had acquired, and this had no doubt been a great drawback to many institutions. He thought the influence of the Society might be brought to bear in this respect, not only in London but in many of the large provincial towns. Mention having been made of the great mercantile companies giving prizes, he did not see why the great employers of labour might not be asked to assist in a similar manner.

Mr. Sales said that while this subject was under discussion he might mention that the Metropolitan Association made application to some of the railway companies to grant them nominations when vacancies occurred in their offices. The secretary of one of the London railways said he should be happy to do all he could to assist them. Subsequently two nominations were sent, and ten candidates were selected for the vacancies, who attended before the secretary. He was satisfied with their fitness for the appointments, but when they came to the question of salary, it was found to be so low that it was impossible for the persons chosen to accept the appointments.

Dr. Pankhurst was persuaded that, as a general rule, the education of persons engaged in business was distinctly dependent upon the limitations of the hours of labour. He was anxious they should keep that point in view, because, if within certain safe limits, the hours of labour were reduced, and if that labour were performed by better educated men, it would be altogether a better quality of labour. He believed the railway travelling of the country was in more peril from the low quality of the men employed in responsible functions than from any other assignable cause. If the proprietors of mercantile houses only appreciated the value of a sound education in the common elements of instruction, or as connected with the class of industry to which they belonged, great impetus would be given to education. The first great principle to be recognised was that they could not get much mental work out of a man if they oppressed him with heavy hours of labour.

Mr. Lawton would remark, on the subject of the employers of labour aiding in the educational scheme of the Society, that owing to a reaction in trade there had been a tremendous demand for labour in certain districts in the North, and in some places the men worked from five o'clock in the morning till nine or ten at night, from October last up to the present month; indeed, in one district not a single candidate was able to go up to the examinations, owing to the excessive demand that was made upon the men's time, principally in the occupation of wire drawing. He was present at a large meeting recently at which an employer offered a situation of a clerkship to the best candidate in book-keeping, and this led to a spirited competition.

Mr. Levy said for his own part he questioned whether education generally would raise the commercial value of a man in the eyes of his employer. But he put the case on higher grounds than mere pecuniary considerations. Education made a man fitter to enjoy life and fulfil his part as a citizen. He denied that they were to look for the benefits of education solely in regard to the interests of the employers of labour, inasmuch as they could never persuade them that studious habits better fitted a man for his business in a menial occupation. They appealed to them on higher grounds, and he believed the great majority of the employers of labour when appealed to on those grounds, would give a hearty response.

Mr. Heller (Lambeth Evening Classes) thought the only way in which they could obtain assistance from the employers of labour was from their purses. He might state that the great drawback to the classes in his locality was the irregularity of the attendances occasioned by over-time work. Out of 182 men in the classes at the commencement of the winter session they only mustered about 70 at its close, and in nine cases out of ten this was caused by the abundance of the demand for labour.

No resolution having been proposed on this subject, the meeting proceeded to the consideration of the next on the list, viz.:—

How can Institutions Promote Competition for the Prizes offered by the Society of Arts in Art-Workmanship?

The Chairman apprehended the best way to assist the Council in this matter was for the visiting officers, and others connected with the institutions, to bring the subject before the members as often as possible.

The Possibility of Establishing Museums of a simple character, to circulate throughout the Country, in connection with Institutions and Evening Schools, on the Plan adopted by the Science and Art Department for Schools of Art.

Mr. F. Talbot (South Staffordshire Association) said this subject was brought before a meeting of the Association a month ago, and it was thought advisable to introduce it to the conference. In his district it was found that the old style of amusement, the tea-party, was becoming unattractive to the members of Institutions at their periodical recreations—the better educated amongst them did not like such gatherings, and they did not tend to add to the number of their members. It was thought that something of a more refined character, in the shape of small exhibitions, could be got up as a means of combining recreation and instruction, particularly in the manufacturing districts, for the members of the Institutions, which he believed would attract a better class of persons than those who delighted in tea meetings. He was aware that the authorities of South Kensington sent out small collections of works of Art., &c., through various parts of the country; but those must be considered somewhat in advance of the acquirements of the class who attended these meetings. He had always felt that models of machinery commanded a great deal of attention, while those selections which were sent from South Kensington were passed by with little interest. He begged to submit a resolution—

"That this Conference desires to express its opinion that District Unions of Institutions should be able to borrow small collections of objects of scientific and general interest for loan to Institutions and Evening Schools within their limits; and that the Society of Arts would confer a great benefit upon the Institutions by moving the Committee of Council on Education to organise a number of small loan collections (through the agency of the South Kensington Museum), of simple productions, illustrative of Natural History and Art, and the great Manufactures of the country, for loan on easy terms to District Unions."

Mr. Holmes seconded the resolution, which was agreed to.

Mr. Pakington proposed a supplemental resolution to the above as follows:—

"That the council be requested to consider whether, without interfering with the operations of the Science and Art Department, they could not offer prizes for local collections of natural objects, such as minerals, fossils, insects, or wild flowers."

Mr. Thomas Lewis (Dover Museum and Philosophical Society) seconded the resolution, considering that great benefits would arise from such collections. He suggested that a system of interchange of the collections might be adopted between the institutions of different districts.

This resolution was also agreed to.

On the next subject, viz:—

By what means can the Society of Arts promote the erection of suitable Buildings for the use of Literary and Mechanics' Institutes?

No observations were offered.

IN WHAT WAY CAN THE SOCIETY OF ARTS AID INSTITUTIONS IN SECURING THE SERVICES OF GENTLEMEN QUALIFIED TO GIVE POPULAR LECTURES ON SCIENTIFIC SUBJECTS?

The CHAIRMAN said this was a question which had been often discussed of late years, but the opinion had prevailed that the Society could do nothing useful in the matter.

After a brief conversation, in which Mr. NOLDWRITT, Mr. REES (London Mechanics' Institution), and Mr. ADAMS (Chatham, Rochester, &c., Institution) took part, an opinion was expressed that it was not desirable to revive the publication of the list of lecturers.

On the concluding subjects, viz.:—

CAN A LITERARY INSTITUTE BE SO CONDUCTED AS TO PROVIDE RATIONAL AMUSEMENT AND THE MEANS OF MENTAL IMPROVEMENT FOR THE VARIOUS CLASSES OF SOCIETY? AND, IF SO, WHAT APPLIANCES ARE NECESSARY FOR THE SUCCESSFUL WORKING OF SUCH AN INSTITUTE?

THE PROMOTION OF ATHLETIC EXERCISES, ESPECIALLY IN THE METROPOLIS AND OTHER LARGE TOWNS, BY ESTABLISHING GYMNASIA OR OTHERWISE.

No suggestions were offered, and the chair having been shortly before resumed by Mr. Hawes, on the motion of Mr. SALES, seconded by Dr. PANKHURST, a vote of thanks was unanimously passed to the council for their continued exertions in the cause of education, and to the chairman for presiding over the conference.

Mr. HAWES, having briefly acknowledged the compliment, the proceedings terminated.

FINAL EXAMINATION, 1866.

The father of the candidate No. 735, Charles Dansey Symonds, to whom the second prize in French was awarded, having written to the Secretary to the effect that his son is in a position in society which precludes him from taking a prize, the second prize in French is therefore awarded to the candidate standing next on the list—No. 696, Charles Christopher Higgins, 19, City of London College, clerk.

Proceedings of Institutions.

NEWBURY LITERARY INSTITUTION.—The twenty-third annual report for the year ending Lady-day, 1866, says that the institution maintains a position of activity and usefulness, and that its advantages have been steadily appreciated by the members. A fancy bazaar, held for three days, for the purpose of liquidating the debt upon the building, resulted, through the kind support of the lady patronesses and the labours of the ladies at the stalls, in the receipt of a sum amounting to £465 17s. 10d., and after deducting £64 16s. 9d. for expenses incurred, a net balance of no less than £401 1s. 1d. remained. A sum of £14 19s. has been handed to the treasurer by Mr. James H. Godding, being the net proceeds of an evening performance of "Samson" at the Mansion-house, £5 13s. from the promenade concert and hall committee, and £5 from the penny reading committee. With these several amounts, together with £118 14s. already invested in consols, making a total sum of £545 7s. 1d., the committee have felt justified in giving notice to the mortgagee of the new building of their intention to pay off the mortgage at the expiration of six months' notice; and they rely upon the public spirit of their friends and the members to clear off, within the current year, the insignificant existing debt of £54 12s. 11d. It will thus appear that, in the short space of five years, a sufficient sum will have been raised to purchase and furnish, at a cost of £1,450, a large and substantial building, well adapted for the purposes of the Institution. The lectures have been generally of a high character, and have given a great amount of satisfaction to the members. The draft throughout the year upon the library, which embraces 3,500 volumes, has been unremitting. The balance-sheet shows that after the payment of the ordinary current expenses for the year, a balance remained of £8 17s. 1d. due to the treasurer.

WALLINGFORD MECHANICS' INSTITUTION.—The twenty-first annual report congratulates the members on the satisfactory condition of the Institute, both as regards the fulfilment of the objects for which it exists, and its freedom from financial difficulties. The balance-sheet shows that, commencing with a debt of £1 0s. 10d. due to the treasurer, it closes with a balance of 19s. 9d. in favour of the Institution. The amount realized by the sale of tickets is £49 17s. 6d., and the number of members, which is 156, shows a slight increase on that of each of the preceding years. The lectures, entertainments, and readings, which have been given during the session, have given great satisfaction. There were nine lectures. Three public readings by members have also been given, and have proved highly successful, the last of which was interspersed with vocal and instrumental music. The committee would recommend the continuance of this cheap and popular form of instruction and amusement, and would suggest that, if practicable, vocal and instrumental music should always form a part of the entertainment. The reading-room has been well attended, but the circulation of books, though good, has not been so great as that of last session, a circumstance to be accounted for by the fact that considerable additions were then made to the library, while this session no money has been expended in that direction. The committee regret that a greater number of artizans are not found taking advantage of the means of self-improvement and recreation afforded by the Institute.

PARIS EXHIBITION OF 1867.—SPECIAL PRIZES.

The regulations concerning the recompenses to be distributed at the Great Exhibition next year have just been published officially, with a report of the Minister of State on the subject. In the report are the following passages, which refer to new conditions respecting prizes:—

"Preceding exhibitions have not brought to light all the qualities which contribute to the prosperity of agriculture and industry. This prosperity is not the result solely of the good quality of the products and the perfection of the methods of working; it depends also upon the satisfactory condition of all the producers, and the good understanding which exists amongst them. In the awards of honorary distinctions at previous exhibitions these circumstances have, without doubt, been taken into consideration to a certain extent, but the Imperial Commission has thought that it would be performing useful work, and in strict conformity with those principles which have inspired so many acts of the Government, in creating a distinct order of prizes from the point of view indicated above.

"These prizes will be awarded to persons, or establishments, or to localities, that have by organisation or special institutions, succeeded in producing good harmony between all those who co-operate in the same labours, and in securing the material, moral, and intellectual welfare of the working classes. The welfare and harmony, of which we propose to seek the best examples, are produced under very varied forms. In certain countries local customs and secular traditions maintain union amongst the various classes of producers; in others, the efforts of intelligent men counteract the spirit of antagonism which is there propagated. In one place the workman, elevated to the position of chief of a workshop, has within himself all the elements of suc-

cess; in another, on the contrary, he is attached to a great factory, and depends in part on the solicitude of the master manufacturer. Sometimes the producers belong exclusively to agriculture or to manufactures; sometimes these two occupations are advantageously combined together. But in the midst of this diversity of condition, welfare and harmony give in all cases the same result; they assure to the producer of every class, and to the locality which his labour enriches, the benefit of public tranquillity. Everywhere also the existence of the two merits which we propose to reward are indicated by very distinct characteristics. Thus an inquiry of this nature, set on foot some years since, by order of your Majesty, by the prefects of the empire, brought to light in a few days many instances which would fall under the fourth head of the following list of prizes. The merits of the competitors will be weighed by a jury composed of eminent persons from the various countries represented at the exhibition. Such a jury, in the opinion of the Imperial Commission, will put out of view all preconceived ideas, and base its decisions solely on well-attested facts. The value of the rewards should be in proportion to the great social importance of the competition. The commission, therefore, proposes to your Majesty to devote to this purpose ten prizes, of the united value of 100,000 francs (£4,000); and, in addition, twenty honourable mentions. One great undivided prize of 100,000 francs in addition, to be given to any person or locality which may be distinguished by decided superiority over all others. This competition will open a new path for universal exhibitions; it will not only contribute to create salutary emulation amongst the various nations, but it will assist in the better statement of important problems, of which the solution has, up to the present time, been insufficient or uncertain."

The following are the principal points in the regulations concerning rewards:—

1. General Dispositions.—A sum of 800,000 francs (£32,000) is devoted to the purpose of rewards to be given on the occasion. These prizes to be awarded by an international jury, whose labours are to be performed between the 1st day of April and the 14th day of May, 1867. The public distribution of the prizes to take place on the 1st of July.

2. Special Regulations concerning the Class of Works of Art.—The prizes placed at the disposition of the jury for works of art are as follows:—

Seventeen grand prizes, each of the value of 2,000 francs (£80).
32 First prizes, each of 800fr.......(£32)
44 Second „ each of 500fr.......(£20)
46 Third „ each of 400fr.......(£16)

Exhibitors on the jury are excluded from receiving any prize.

3. Arrangements respecting the nine groups of agricultural and industrial products:—

Grand prizes and rewards in money to the amount of 250,000 francs (£10,000).
100 Gold Medals of the value of 1,000 francs each (£40).
1,000 Silver Medals.
3,000 Bronze do.
5,000 Honourable Mentions, at the utmost.

All the medals will be from the same die.

The Grand Prizes are intended as rewards for inventions or improvements which have produced considerable improvement in the quality of productions, or in the processes of manufacture.

The award of the prizes in these groups will be by the successive operation of juries of classes, juries of groups, and a superior council.

4. Special arrangements respecting the new series of rewards (already described above).

10 prizes, of a total value of 100,000 francs (£4,000); 20 honourable mentions; 1 grand prize of 100,000fr. The special jury appointed to award these prizes will determine the distribution of the values and the form of the reward. The claims and documents intended to point out any person, establishment, or locality, for recompense under this new group, must be sent in to the Commission before the first day of December in the present year.

Final Regulations Relative to the Fine Art Group.

The Imperial Commission has settled the conditions relating to the Fine Arts, the purport of which is as follows:—

Art. 1. The works of French and foreign artists admissible, are such only as have been executed since the 1st of January, 1855, and were not exhibited in the Universal Exhibition of that year.

Art. 2. The following works are excluded:—1. All copies, except engravings and lithographs, even those which reproduce a work in a style different from that of the original.—2. Works without frames.—3. Clay models not baked.

Art. 3. French works are to be admitted by a jury of fifty-seven members, in four sections: Painting and drawing, twenty-four members; sculpture and die sinking, fifteen members; architecture, nine members; engraving and lithography, nine members. One-third of this jury to be elected by French artists, members of the Legion of Honour, or having received a medal at the Exhibition of Fine Arts in Paris; one-third by the Academy of the Beaux Arts; and one-third by the Imperial Commission.

Art. 9. The works of French artists are to be sent in to the jury before the 15th of October, 1866. But the jury reserves the right of admitting works of incontestible value without requiring them to be submitted to the jury.

Art. 10. The admission of the works of foreign artists is left to the care of the Commission of each country.

Art. 11. The works of foreign artists are to be delivered at the Exhibition building between the 15th of January and the 10th of March, 1867.

Art. 12. Each foreign Commission is to supply its catalogue of works to be exhibited to the Imperial Commission before the 1st of February, 1867.

The *Impartial* of Smyrna states that the Viceroy of Egypt has ordered the contents of the Museum of Antiquities of Boulacq to be sent to the Exhibition. This important contribution will occupy a special place, to be called the Egyptian Bazaar, and will be attended by fifty Egyptians, wearing the national costume.

Refreshments.

1. The Imperial Commission requires that every nation should represent at the Exhibition the varieties of food and drinks peculiar to it; such food and drinks being consumed, and orders taken for them in the Exhibition. The different establishments where they are sold will be considered as part of the Exhibition, and eligible to compete for the various prizes offered.

2. In consideration of a profit being derived from the sale of refreshments, the Imperial Commission charges a certain rental for the space offered for them, to the United Kingdom at rates varying from £8 to £13 a foot frontage, having a depth of about 33 feet. The cellars under this space will be let at a minimum rate of £15s. per yard superficial.

3. The exhibitors will have to bear the expense of their own fittings of all kinds, which may be estimated at not less than £10 a foot frontage; also of water, gas, and all other expenses relating to their own space. The total cost of the frontage, say at £22 per foot, divided over 214 days during which the Exhibition will be open, is, therefore, at the rate of about 2s. 1d. per foot frontage per day. After the Exhibition itself is closed, the refreshment-rooms and park (where various kinds of theatrical and musical entertainments will be carried on) will remain open until 11.30 at night.

4. It is proposed to let the space offered to the United

Kingdom for refreshments, to producers or purveyors of the different kinds of food and drinks, in frontages of not less than 18 feet. A purveyor for the supply of one kind of refreshment may tender separately, but if more convenient may combine with one or more persons supplying different kinds of refreshment, to have one counter; thus specimens of the stout of London and Dublin, Edinburgh, and Burton ales may each be sold at separate counters, or sold with ham sandwiches, oysters, or with Stilton, Chedder, Cottenham, Cheshire, Wiltshire, Gloucester, and other kinds of cheese. Tea and marmalade; coffee and biscuits; samples of whiskey, gin, cherry brandy, etc., might be sold at separate stalls. The rentals to be charged to exhibitors will vary according to the character of the objects sold, and other circumstances; and proposing exhibitors are requested to make biddings for space in advance of the charges specified.

5. Stalls for breakfasts and suppers may be established where preserved meats, fish, fruits, and other edibles peculiar to the United Kingdom may be sold, it being desirable that each stall should have its peculiar feature.

6. There will be only one general stall where hot cookery will be provided. The contractor for this must combine with each exhibitor of drinks for the supply of them if asked for. Certain kinds of eatables may be obtained from the general contractor for food by the exhibitors of drinks.

7. Exhibitors must pay half the rental in advance upon receiving their allotment of space, and the remaining half on the 1st April, 1867, and agree to conform to all the official regulations which may be laid down.

8. Persons desirous of exhibiting are requested to communicate with the secretary, Paris Exhibition, South Kensington Museum, London, on or before the 1st July.

Meetings of the intending metropolitan exhibitors in classes 13, 45 and 46, have taken place at the Society's house during the past week, and sub-committees have been appointed for the allotment of space amongst the claimants in each class.

Commerce.

The French Beetroot crops are, as yet, reported to be not particularly good. Every one, says the *Journal des Fabricants de Sucre*, speaks of the unfavourable effect on the roots of the late unseasonable cold and drought. The appearance, in general, is by no means bad; but at the same time the crop is so far considerably later than last year. Whatever the prospects of the next season may be, the result of the last shows the extraordinary importance that the French beetroot crop has attained. The *Moniteur* has published the returns to the end of April, and it appears that the production to that date was no less than 265,489 tons against 145,395 last year. The exports for the season to the end of April were 42,769 tons, against 2,351 tons in the same part of 1864-65; but notwithstanding this great increase, the stock in beetroot on the 30th April was 52,521 tons, against 28,838 tons last year.

Salt Exports.—The exports of British salt seem to be decreasing. In 1856, 745,788 tons were shipped, last year only 577,880 tons were exported. The exports to the United States have been considerably increasing of late, but on the other hand they have largely declined to British India. In 1855 the value of the salt exported was £347,685, last year it was only £275,890.

Gloves.—It is estimated that the value of the gloves manufactured in France is between £1,600,000 and £2,000,000 and is still rapidly increasing. The kid and lamb skins used for glazed gloves are dressed at Paris, Grenoble, Annonay, Romans, and Charmont. The Paris manufacturers, whose gloves are most highly esteemed, employ workmen from Vendome.

Colonies.

State of Victoria.—The quantity of land occupied in 1864 was 6,125,204 acres, of which 5,000,000 are freehold. The actual extent of land under tillage is only 479,463 acres, or 28,000 acres less than in 1863. The quantity of wheat sown in 1864 was 125,040 acres, against 149,392 in 1863, and there was also a corresponding falling off in the cultivation of barley, oats and hay. In 1863 149,392 acres of wheat gave 1,338,762 bushels of grain, and in 1864 125,040 acres gave 1,899,378 bushels, showing that the land increases in productiveness. In 1864 there were 3,594 acres in vines, representing 8,750,408 vines, producing 110,042 gallons of wine, and 225 of brandy. The live-stock in the colony is estimated as follows:—117,182 horses, 152,257 milch cows, 488,368 other cattle, 8,406,234 sheep, and 1,135,30 pigs. The majority of the sheep were distributed over 1.177 runs, or an area of 30,463,999 acres. The agricultural machinery employed in extracting the produce of the land is 999 reaping machines, 343 threshing machines, 3 steam irrigators, and one steam plough. 93 mills, employing 1,691-horse power, and grinding 2,206,576 bushels of wheat, gave for the year 1864 nearly 50,000 tons of flour. The estimated expenditure for the year 1866 is £3,318,239, or an increase of £282,000 over that of 1865. The new duties are expected to produce about £200,000, making a total of estimated customs' revenue of £1,303,450; excise, £39,000; territorial revenue, £878,850. The principal items included in it are £225,000 from leases under the new Land Act; £220,000 from sales by auction; £170,000 from rent and selections; £192,000 from pastoral occupations; and £20,000 from leases of auriferous lands. The expected income from public works is £704,000, including £598,000 from railways, £70,000 from the Yan Yean, and £36,000 from telegraphs. Tonnage dues are estimated at £19,000; postage, £120,000; fees, £65,000; and fines and forfeitures, £18,000; and miscellaneous at £38,000.

The Vine in Victoria.—A Melbourne paper says there are few places which seem so well fitted for vine growing as this colony. In climate, in soil, in the undulating outline of the surface of the ground, abounding as it does with gentle elevations, presenting the most propitious aspects for the ripening of the vine, this region of Australia is especially remarkable. In climate, which is the main consideration, Victoria is most happily placed, the mean annual temperature of Melbourne being 57 deg. 6 min. Fahrenheit. When vine culture is, therefore, developed, it may be expected to produce dry wines, such as Bordeaux and Burgundy, in all the vineyards south of the dividing range where the best kind of grapes have been planted. The mild winters and comparative absence of severe frosts, the shelter from the autumn rains of the east coast which the dividing range from Gipps-land affords, the usually steady dry heat and sunshine of the ripening months, all go to confer special advantage on Victoria as a vine-growing country. Vineyards of recent origin are beginning to spring up in various parts of the country, and in a short time hence it is hoped Melbourne, Castlemaine and Sunbury, Sandhurst, and especially the large district adjoining the River Murray, of which Beechworth is regarded as the chief town, will each vie with, and in some respects perhaps excel the Geelong neighbourhood, both in the quantity and quality of their wines.

To Correspondents.

Iron Oxide Paint.—The Editor has received letters from Mr. John Lundy, of the North British Colour Company, Leith, and from Messrs. Ellam, Jones, and Co., Markeaton Mills, Derby, in reference to the recent paragraph in the *Journal*,

(p. 493), speaking of the Torbay iron oxide paint. These gentlemen state that their firms have for many years manufactured iron oxide paint, and that it has been extensively and successfully used as a preservative of iron structures.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, 8½. Mr. S. W. Baker, "Explorations on the Atbara in Abyssinia."
Tues. ...Medical and Chirurgical, 8½.
Zoological, 8½.
Ethnological, 8.
Wed. ...Society of Arts, 4. Annual General Meeting.
Thur....R. Society Club, 6. Annual General Meeting.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 6th June, 1866.*
168. Bill—Carriage and Deposit of Dangerous Goods.
160. (IV.) Election Expenses (Scotland)—Return.
289. Copper, &c.—Return.
291. Whitworth Guns—Return.
294. National Debt—Statement.
316. Burghs (Scotland)—Returns.

Delivered on 7th June, 1866.
177. Bill—National Gallery Enlargement (as amended by Select Committee).
24. (I.) Sheriff Courts (Scotland)—Return.
309. Poor Law (Ireland)—Return.
326. New Courts of Justice—Instructions.

Delivered on 8th June, 1866.
178. Bills—Hundred Bridges.
179. „ County Assessments.
181. „ Dogs.
298. Durham University—Return.
301. East India (Oude Claims)—Return.
318. Dockyard Voters—Return.
323. Army (Recruits)—Return.

Delivered on 9th June, 1866.
180. Bill—Public Health.

Delivered on 11th June, 1866.
173. Bills—Vaccination (as amended by Select Committee) (corrected copy).
175. „ Oyster Bed Licenses (Ireland).
182. „ Dean Forest (Walmore and the Bearce Commons) (as amended by Select Committee).
69. (V.) Railway and Canal Bills—Sixth Report.
188. Penal Servitude Act—Return.
335. County Electoral Statistics; and Occupiers and Owners of Property in Counties—Returns.

Delivered on 12th June, 1866.
183. Bill—Princess Mary of Cambridge's Annuity.
275. Navy (Crime and Punishment)—Report.
328. Gibraltar and Malta—Return.
331. Peninsular and Oriental Steam Navigation Company—Agreement.
Cattle Plague Inquiry—Report on the Origin, Propagation, Nature, and Treatment, by Alexander Williams.

Delivered on 13th June, 1866.
184. Bills—Reformatory Schools (amended).
185. „ Industrial Schools (amended).
187. „ Church Rates Amendment.
302. Shipping Returns.
304. Chain Cables and Anchors—Return.
329. Army (Medical Officers)—Warrant.
338. Universities (Scotland)—Return.
British Columbia and Vancouver Island—Papers relating to the proposed Union.

Delivered on 14th June, 1866.
174. Bills—Landed Estates Court (Ireland).
176. „ Straits Settlements.
186. „ British Columbia.
188. „ Pier and Harbour Orders Confirmation (as amended by Select Committee).
190. „ Landlord and Tenant (Ireland).
307. Treason-Felony (Ireland)—Papers.
330. Army (Officers' Commissions)—Returns.
335. County Electoral Statistics, and Occupiers and Owners of Property in Counties—Returns (corrected Copy).
340. Army Prize Money—Account.
Straits Settlements—Correspondence.

Delivered on 15th June, 1866.
189. Bills—Sale and Purchase of Shares.
317. Lunacy—Twentieth Report of Commissioners.
319. Gaols—Return.
344. Oaths—Colonies—Return.

Patents.

From Commissioners of Patents' Journal, June 15th.

Grants of Provisional Protection.

Agricultural implements—1438—G. W. Homer.
Blast furnaces—1469—G. F. Goransson.
Beer coolers—1499—T. Haigh.
Boiler tubes, cleaning—1511—Earl of Caithness.
Boots and shoes, rendering durable—1502—J. Wadsworth.
Buildings, construction and ornamentation of—1358—B. Nicoll.
Cartridges, closing ends of—1484—J. Erskine.
Cartridge extractor for breech-loading guns—1460—J. Emme.
Coiled springs—1459—J. W. Evans.
Compasses—1510—W. R. Hammersley.
Detector for securing safes from burglary—648—A. Hosking.
Felt carpets—1276—A. Roders.
Fire-arms, breech-loading—1417—G. V. Fosbery.
Fire-arms, breech-loading—1464—J. Purdey.
Food, apparatus for warming—1467—E. Bevan and A. Fleming.
Gas pyrometers—1470—B. F. Weatherdon.
Gas regulators—1488—D. Duff.
Gas, regulating the pressure of—1386—O. Brothers.
Girders and joists, iron—1454—W. Heathfield.
Hair felt—1342—J. White.
Horse-rakes—1474—J. G. Rollins.
Hydraulic presses—1482—H. Stuttle.
Lamps—1439—J. and J. Hincks.
Metal rods, bars, &c., manufacture of—1462—W. Gibson and E. Ellis.
Pianoforte strings, regulating—1494—G. Haseltine.
Pneumatic railways—376—J. A. Maxwell.
Railway signals—1122—T. Alderman.
Refrigerators—1508—E. A. Pontifex.
Safes, locks, &c.—1390—E. and C. Price.
Ships, iron-built, prevention of fouling—352—J. Russell.
Ships' rudders—1486—C. F. Henwood.
Ships, recovering sunken—910—H. A. Bonneville.
Stereotyping, matrices for—1448—G. Haseltine.
Target, perforated elastic-faced cellular—1491—J. Hall.
Telegraphic printing apparatus—1504—C. T. Bowdoin.
Type composing and distributing machinery—1496—I. Delcambre.
Weft forks—1506—H. Schofield.

Patents Sealed.

3261. S., S., J., & W. Whitehouse.
3266. O. C. Burdict.
3267. H. C. Ensell.
3268. H. Planck.
3269. A. S. Brooman.
3270. J. Bolton.
3271. G. S. Harrison and S. E. Featherstone.
3291. M. Siégrist.
3295. F. L. and C. L. Hancock.
3299. W. Boggett.
3319. G. T. Bousfield.
3321. S. Chatwood.
3357. C. F. Varley.
405. G. D. Davis.
457. W. R. Lake.
533. W. E. Gedge.
535. W. R. Lake.
773. A. G. Lock.
1039. A. H. Brandon.
1083. T. Haimes.

From Commissioners of Patents' Journal, June 19th.

Patents Sealed.

3302. W. Barnsley.
3303. G. Davies.
3304. W. E. Newton.
3312. D. McGrath.
3313. J. Anderson.
3314. E. Deane.
3317. G. Davies.
3322. H. A. Dufrené.
3323. E. Clifton.
3328. E. Dwyer and H. Moen.
3330. H. D. Hoskold and W. B. Brain.
3332. F. W. Webb.
3335. W. Gill and B. Bird.
3336. E., J. C., and J. Lones, J. and T. Brettell, and C. Vernon.
3337. C. Reeves.
3348. W. C. Dodge.
19. J. Pilling and R. Smith.
46. H. Ames.
81. W. E. Newton.
336. T. Molden.
432. R. Wolstenholme and R. G. Rodgers.
674. G. Haworth, T. Parrington, and W. Hudson.
709. J. A. and A. Norman.
912. W. R. Lake.
986. W. Cole.

Patents on which the Stamp Duty of £50 has been Paid.

1466. G. Davies.
1476. G. Davidson.
1486. M. B. Westhead.
1511. J. C. Onions.
1513. W. H. Dawes.
1555. W. L. and T. Winans.
1556. W. L. and T. Winans.
1557. W. L. and T. Winans.
1558. W. L. and T. Winans.
1502. F. S. Williams.
1539. J. Watts.
1537. A. Morel.
1602. R. Mushet.

Patents on which the Stamp Duty of £100 has been Paid.

1417. T. F. Henley.
1436. E. J. Maumeme and V. Rogelet.
1456. T. Cattell.
1460. J. Combe and R. Smallpage.

Registered Designs.

Portable Croquet Marking Table—4794—June 16th—J. J. Jaques and Son, 102, Hatton-garden, London.
The Zouave Marine Swimming or Bathing Dress—4795—June 16th—John W. Scott, Sidbury Works, Worcester.

Journal of the Society of Arts.

FRIDAY, JUNE 29, 1866.

Announcements by the Council.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement:—

Burnley, Church of England Literary Institution.

Proceedings of the Society.

ANNUAL GENERAL MEETING.

The Annual General Meeting, for receiving the Report from the Council, and the Treasurers' Statement of Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, was held, in accordance with the Bye-laws, on Wednesday, the 27th inst., at 4 p.m. WILLIAM HAWES, Esq., Chairman of the Council, presided.

The Secretary having read the notice convening the Meeting, the minutes of the last Annual General Meeting, and of the subsequent Special General Meeting, were read and signed.

The Chairman then nominated Mr. Botley and Mr. Purling as scrutineers, and declared the ballot open.

The Secretary then read the

ANNUAL REPORT OF THE COUNCIL.

The Council have now the pleasure of meeting the members at the close of the one hundred and twelfth Session, and of laying before them, in compliance with the Bye-Laws, a report of the transactions of the past year, a duty which they perform with all the more satisfaction, as they feel that they may with reason congratulate the members on the increased influence and prosperity of the Society.

MEDALS AND PRIZES.

The subject of the prize placed at the disposal of the Council by Sir Walter Trevelyan, and offered for the preservation of meat in a raw state, naturally engaged attention at a time when the prevalence of the cattle plague and the high price of meat, gave rise to serious apprehensions in the public mind as to the supply of food for the people. Several claimants have brought their plans before the Council for effecting the objects sought, but no process has yet been sufficiently matured to justify the Council in awarding the prize, though the progress made in the experiments warrants the expectation that at no distant period the object may be attained.

The enormous tracts of peat in the United Kingdom, and especially in Ireland, have long attracted the attention of thoughtful men, in the hope that something might be done to render useful that which, up to the present time, has remained nearly valueless to the community. Many have been the endeavours to convert into an available and effective fuel at a reasonable cost that important product, which, containing as it does all the chemical elements suitable for combustion, has hitherto baffled the efforts of our inventors. One of the Council, Mr. Bailey Denton, liberally placed at their disposal a sum of £50, as a prize for the production of useful fuel from peat; to this sum the Council added the Society's Gold Medal, the conditions of the offer being, that the fuel "shall be equal in quality to good household coal for ordinary purposes, and capable of being sold in the market commercially at less cost than such coal; the attainment of this object to be demonstrated practically and on a commercial scale." No process has yet been submitted to the Council for which they could feel justified in awarding the prize, but from communications that have been made to them, it appears that some progress at least has been made towards the desired end.

The promoters of the great International Horticultural Exhibition and Botanical Congress, recently held with so much success, applied to the Society early in the present Session to aid the undertaking, and it was found that the Council could best do so, and at the same time promote the legitimate objects of the Society, by offering prizes for implements connected with the advancement of Horticulture, and they therefore decided upon offering the sum of £50 as prizes for objects of this nature. A detailed account of these prizes was published in the *Journal*, p. 86. Some of them, it is understood, have been awarded, but the report of the Judges has not yet been received.

In the last list of premiums issued by the Society, a prize was offered "for the introduction into commercial use, at a moderate price, of the essential oils of Australia." This prize has been claimed by Mr. J. Bosisto, for the importation of the essential oil of the Eucalyptus, which, it appears, he has made an article of regular commerce, and the Committee to whom the Council referred the consideration of the claim having unanimously recommended them to award to him the Society's medal, this award has accordingly been made.

For the papers read during the Session silver medals have been awarded by the Council as follows:—To Mr. J. C. Morton, for his paper "On London Milk;" to Mr. Thomas Gray, for his paper "On Modern Legislation in regard to the Construction and Equipment

of Steam Ships;" to Dr. J. L. W. Thudichum, for his paper "On the Diseases of Meat as affecting the Health of the People;" and to the Hon. Charles Gavan Duffy, for his paper "On some Popular Errors concerning Australia."

Whilst on the subject of prizes, the Council have pleasure in recording that Mr. Alfred Davis, a member of the Society, has placed in their hands the sum of 20 guineas to be awarded as a prize for any subject for which they may deem it desirable to offer it. What that subject shall be, it will be the duty of the succeeding Council to determine.

The success of the North London Industrial Exhibition placed at the disposal of the committee of that undertaking a net surplus of £150, and this sum the committee requested the Council of the Society to take charge of and invest, as Trustees, the interest therefrom to be applied as a prize, to be called the North London Exhibition Prize, and to be awarded annually by the Council for the best specimen of skilled workmanship that may be exhibited for competition at the Society's house; but in the event of a Museum being instituted in the north of London, the principal is to be paid over to the trustees of that museum, for the purpose of purchasing objects to be placed therein. The Council have accepted this trust, and the money has been invested in the name of the Society in the purchase of £167 7s. 3d. consols. The attention of workmen and others has been called to this prize in the Art Workmanship Programme, put forth by the Society for the current year. The members have been already made aware of the results of the art workmanship competition for the present year, the details having appeared in the *Journal*, p. 154. The Council feel much indebted to Messrs. Richard Redgrave, R.A., M. Digby Wyatt, and Alfred Morrison, for their valuable services, as judges of the works sent in by the competitors, and it will be a source of gratification to the members to know that many of the best productions have been purchased by the Department of Science and Art, for the South Kensington Museum.

Before renewing the competition for another year, the Council thought it right to confer with the workmen themselves on the subject, so as to ascertain whether any alterations in the conditions and terms of offer were desirable, with the view of rendering the competition more attractive to the class whom it was desired to benefit. At one of the evening meetings the workmen were therefore invited to attend, and a report from the secretary having been read, showing what had been done and the results of the three competitions already held, a discussion was taken. It did not appear that any material alteration in the terms and conditions already settled was needed, but, in order to meet the views entertained by some of the workmen, who thought that their efforts should not be entirely confined to the working from prescribed models or examples, it was determined to introduce a clause, following the offer of prizes in the various departments of art workmanship executed after prescribed designs, to the effect that any producer will be at liberty to exhibit, either in his own name or in the name of his workman, any work or works as specimens of good workmanship in the various classes, provided that the work or works be accompanied with a statement of the name or names of the artizans who have executed their respective portions; and, if the works be sufficiently meritorious to deserve them, extra prizes will be given to the artizans who have merited them. Another clause was added, to the effect that artizans may, if they think fit, exhibit works executed by them after their own designs in any of the classes, and such works may or may not contain the whole or a portion of the prescribed designs, but must be of a similar style and character, and extra prizes, when deserved, will be awarded. The Council have added, as a further inducement for competitors to come forward, that after the articles have been exhibited in the Society's rooms and at the South Kensington Museum, a selection of the best works will be made, and sent to the Paris Exhibition of 1867.

The Albert Gold Medal, for distinguished merit in promoting Arts, Manufactures or Commerce, has this year, with the cordial approval of His Royal Highness the President, been awarded by the Council to Professor Faraday, whose "discoveries in Electricity, Magnetism, and Chemistry, in their application to the industries of the world have so largely promoted Arts, Manufactures, and Commerce." The Council feel that to attempt to enumerate all which that distinguished philosopher has done, would involve the writing a history of physical science, and its bearing on the material progress of mankind during the last forty years. The name of Faraday carries with it such a world-wide reputation as to need no detailed statement of his discoveries and researches to recommend this award to the sympathy of the members. Indeed, it may be truly said, that while the Society thus confers an additional distinction on that singularly high-minded and unselfish man, whose merit all scientific bodies, both at home and abroad, have for many years past vied with each other in recognizing, it does itself honour by thus associating itself with so eminent a name. The health of Professor Faraday not admitting of his attendance at a general meeting of the members of the Society, Mr. Hawes, Chairman

of the Council, accompanied by Sir Thomas Phillips, one of the Vice-Presidents, and the Secretary, waited upon the Professor, by his request, at his residence, on Saturday, the 16th inst., and presented him with the medal, on receipt of which he expressed much gratification.

Cantor Lectures.

Three courses of these lectures have been delivered during the Session. The first was by Mr. G. W. Hastings, LL.D., "On the Effects of the Discovery of the Precious Metals," "On Copyright," and "On Limited Liability." The second course was by Mr. Fleeming Jenkin, F.R.S., "On Submarine Telegraphy;" and the third by Dr. F. Crace Calvert, F.R.S., "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures."

These lectures continue to be well attended, proving that the Council did not over estimate the interest which the treatment of subjects of so much importance by men, all eminent in their respective branches of knowledge, would be likely to excite amongst the members. Abstracts of the first two courses have already appeared in the *Journal*, and a full report of Dr. Crace Calvert's lectures will, as on former occasions, be published during the vacation. Two of the gentlemen who appeared before the Society during the past Session were already well-known to the members, and the valuable character of their lectures was acknowledged. The third, Mr. Fleeming Jenkin, gave a most interesting course upon a subject which, notwithstanding its important bearing on commerce and the affairs of every-day life, is comparatively little known. The lecturer's able and clear treatment of his subject, and the manner in which he succeeded in gaining the attention of his audience to questions, many of them of a very abstruse and difficult character, will be remembered by all who were present at that course.

Dwellings of the Labouring Classes.

The Committee, which made its report last year, was re-appointed at the commencement of the Session, with the view of endeavouring to get the recommendations embodied in that report carried out, so far as might be found practicable. One of those recommendations was, that, with the view of extending an accurate knowledge of the powers contained in the Acts providing for the removal of nuisances, the Council should prepare and publish a concise analysis of the existing laws, calling the attention of the educated classes to this important subject, and pointing out how, merely by a little exertion on their part, they may confer most important benefits upon a large mass of working people, and upon the country generally. Accordingly, the Committee induced Mr. Martin Ware, barrister-at-law, to undertake the preparation of such a work, and Messrs. Bell and Daldy, the Society's publishers, took the risk of publication. The book was brought out by them in a cheap form, at the price to the public of sixpence, the Society having a certain number of copies free of charge for distribution amongst such persons as might be likely to take an interest in the subject and promote the objects in view.

The Council also brought under the consideration of Her Majesty's Government another recommendation of this committee, namely, the importance of the Government Loan Commissioners being empowered to advance money at a low rate of interest for the building of dwellings for the labouring classes, under suitable guarantees and with due regard to sanitary arrangements, and they have much pleasure in informing the members of the Society that this year the Government have passed a bill through Parliament giving such powers.

In connection with this subject, the Council have to add that, at the request of Mr. James Hole, of Leeds, they have permitted a work prepared by that gentleman, on the Dwellings of the Labouring Classes, to be published under their sanction. They had much pleasure in acceding to Mr. Hole's request, as that gentleman has had considerable practical experience in all matters connected with the working classes and their dwellings for many years; and, some fourteen years ago, gained the Society's prize of £50 for his valuable essay on Mechanics' Institutions. The Council have also been engaged, in conjunction with the Association for the Promotion of Social Science, in other measures for the improvement of the dwellings of the working classes; and a joint committee of the two Societies has prepared a Bill for granting powers to certain bodies, under certain conditions, to purchase compulsorily property which, either by neglect of the owner or by the uses to which it is applied, has become unhealthy or a nuisance to the neighbourhood, and to erect thereon dwellings of an improved character suitable for the working classes. The Bill, however, owing to the condition of public business in the House of Commons not affording much chance of its being passed this Session, has not yet been brought before the Legislature. The Draft Bill will be found printed at p. 443 of the *Journal* for the present year.

Musical Education.

The evidence taken before the Committee on this subject has been closed. It has been published from time to time in the *Journal*, and has been found to excite much interest, both amongst the members and the public generally. The Committee have made their first report,

but in order to give it practical effect, much careful deliberation will be necessary. Since the appointment of the Committee, the Royal Academy of Music has received notice to quit the premises near Hanover-square, which it has occupied ever since its foundation, and it is now leaving them. If the Royal Academy is to be the centre of the musical education of the United Kingdom, the possession of suitable premises is a necessity, and some long time must elapse before they can be built, even after the necessary funds are procured. The Council are confident that there is a strong desire springing up in the public mind that the musical education of the people of this country should be placed on a much improved basis, and feel satisfied that, when this desire is expressed, Parliament will give it due attention, The Council are of opinion that no efforts should be wanting on the part of this Society to assist the cultivation of a fine art so well calculated to aid religious observances, and promote the moral elevation and healthy recreation of all classes of society.

Copyright in Works of Art.

Early in the year the Council received a memorial, signed by no less than one hundred and thirty-three of the leading artists, painters, sculptors, and engravers, as well as publishers of works of art, pointing out the present defective state of the Engraving and Artistic Copyright Acts, and requesting the Council to give their serious attention to the subject with a view to obtain some speedy amendment of the law so as to give effectual protection to the proprietors of copyright in such works; and the memorialists specially dwelt upon the very serious injuries to which the proprietors of engravings were subjected by reason of the piracies effected by means of photography, and the importance of obtaining from the Legislature summary remedies by which such piracies could be put down.

The Council at once expressed their willingness to undertake the duty, and invited the memorialists to meet them in conference, and decide upon the best course to be taken; accordingly a meeting took place on Friday, the 2nd of February, which was numerously attended, and the various points having been discussed, the Council undertook to have a bill prepared, embracing as far as possible the views expressed at the meeting. A draft bill has accordingly been drawn, and will shortly be printed and brought before the memorialists for their approval. It has however been found that the same reasons which prevented the bringing forward the bill connected with the Dwellings for the Labouring Classes, must preclude any legislation on this subject during the present session of Parliament.

Piracy of Trade Marks.

The importance which this subject has now assumed, especially since the passing of the Merchandize Marks Act of 1863, has rendered it necessary that some further legislation should take place in order to protect the interests, not only of traders and merchants, but also of the public in general; this was well pointed out in a paper read before the Society this session by Mr. E. M. Underdown [see *Journal*, p. 370]. The question has occupied the serious attention of the Council, who appointed a Committee to inquire into and report upon the subject, and on this committee they obtained the services of a number of gentlemen connected with the leading manufactures of the country, as well as lawyers and others having special knowledge of the question.

At the first meeting of the committee it was found that a bill for remedying the grievances complained of was in course of preparation by direction of Mr. Michael Bass, M.P., one of the members of the Committee; at a subsequent meeting the Draft of the Bill was laid before them, and, having been taken into consideration, met generally with their approval. The Committee subsequently had interviews with the Board of Trade upon the subject, and there is reason to believe that the provisions proposed in the bill, and especially that portion of it so essential to the good working of the measure—a Registry of trade marks—will meet with the approbation of the Board.

Memorial Tablets of Eminent Persons and Remarkable Localities.

The expediency of marking in some suitable manner the spots where eminent men have lived and died, as well as localities connected with remarkable events, has occupied the attention of the Council, and a committee has been appointed to inquire and report how this may be effected. This committee has collected a considerable amount of information, which it is intended to publish from time to time in the *Journal*. The objects and scope of the committee are well explained in a letter from Mr. George Bartley, published at p. 437 of the *Journal*.

The committee are now engaged in investigations as to the best methods to be adopted for marking such houses and localities.

Paris Universal Exhibition, 1867.

The Commission appointed by Her Majesty in connection with this Exhibition applied to the Council early in the session to give their aid to the undertaking. This request, it need hardly be said, the Council readily complied with, and they placed the rooms of the Society at the disposal of the various committees of metropolitan exhibitors convened for the purpose of arranging the space allotted to the respec-

tive classes; the Secretary has been engaged in attending these meetings, and giving such assistance and explanations as were required to facilitate the work. All the committees have now met, and nearly all have completed the allotment of space.

UNION OF INSTITUTIONS.

The Secretary's report, read to the Conference of representatives of Institutions held on the 13th inst., and published in the *Journal* for the 15th inst., shows the position of this branch of the Society's operations, and to this the Council beg to refer.

The Society's system of Annual Examinations, which has been in operation during eleven years, has extended itself, through the instrumentality of the Local Educational Boards, to about one hundred of the most important centres of population in the United Kingdom: and these Local Boards for the most part have not only assisted to carry out the Society's own Examinations, but have held, on their own authority, other preparatory Examinations in elementary subjects, with the view of leading on younger and less advanced persons to become candidates for the Society's certificates and prizes. By such means the Society has been directly and indirectly the cause of providing wide spread encouragement to the education of adults of the industrial classes; and its example has been followed very largely and effectively by the Government Department of Science and Art, which has established a system of Annual Examinations, resembling in all its principal features, the system which this Society first propounded in 1853 and still carries on. It is also a matter of congratulation for the friends of this Society, that the Local Examinations of the Universities of Oxford, Cambridge, London and Durham, had their origin in the movement which this Society commenced.

In 1865, and in the present year, this Society has had the advantage of the co-operation of the Royal Horticultural Society, in those parts of its system of Examination which relate to botany and the practical arts of cultivating flowers, fruits and vegetables. If other Societies and public bodies would unite, in like manner, with this Society in extending a knowledge of these Examinations, in offering encouragements to those who might avail themselves of them, and in publicly recognising the value of the certificates, the system would rest on a broader basis, and a great deal more good might be done.

FINANCE.

The Council append to this report the usual financial statement of the accounts of the Society and a balance-sheet. These were published, in accordance with the bye-laws, in the last number of the Society's *Journal*. The members will bear in mind that the recent renewal of the Society's lease, coupled with heavy expenses for repairs and refurnishing the Society's meeting room and library, had in a previous year involved the Society in a very large outlay, which had to be met at once, and could only be discharged by anticipating to some extent the Society's revenue, and spreading the cost over a number of years. In order to enable this to be done, the Council thought it right to obtain an advance from their bankers, and during the course of the past year, as appears by the accounts, the sum of £1,300 was borrowed, which has been repaid.

It will have been observed that the accounts are not signed by the auditors elected at the last annual meeting. Mr. Reader Lack resigned his office in consequence of having been directed by the Government to proceed to Vienna; Mr. Philip Wright went to Australia last autumn, and did not return in time to complete his audit of the accounts. In the meantime the Council, in conformity with the Bye-laws, appointed an auditor in place of Mr. Reader Lack—Mr. W. T. Mackrell, by whom the accounts have been audited and signed.

The report having been unanimously adopted,

Mr. COHEN proposed a vote of thanks to the Council for their valuable services during the past year.

Mr. BOTLEY seconded the motion. He felt that the Society was deeply indebted to them for the able manner in which they had conducted its affairs; for his own part he thought the institution of the Cantor Lectures, and the arrangements that had been made in reference to them, were especially creditable to the Council.

The vote of thanks having been put by Mr. Botley, and unanimously passed,

The CHAIRMAN, in acknowledging the compliment on the part of himself and his colleagues, said he thought the fact that the number of members was as great now as in 1862, the year of the International Exhibition, when there was naturally an unusual amount of interest excited in the Society's operations, was a strong proof of the high estimation in which it continued to be held, and of the approbation with which the conduct of its affairs was regarded.

Mr. GEORGE WHITE, cordially concurring in the vote of thanks which had just been passed, wished to offer one or two suggestions, if he might be permitted to do so. He thought the hour at which the Wednesday evening meetings took place might advantageously be changed to an earlier one. There were many members, like himself, who resided out of town, and who experienced great inconvenience from the lateness of the hour at which the discussions closed. He thought that if the meetings began at seven o'clock and ended at nine it would be more convenient. It might even be worth consideration whether the hour might not be made earlier still, so as to enable members to attend after leaving their business, and before dinner. In that case five o'clock would seem a suitable time, though, perhaps, the general body of the members were hardly yet prepared for so radical a change. He also thought the papers read were in many cases too long; if they were of such a length as only to occupy half-an-hour, there would be more time for discussion, and the meetings would be more interesting. As to the Cantor lectures, on the other hand, he thought they might with advantage be somewhat lengthened, and that in some cases, perhaps, the subjects treated might be discussed, or a few questions put to the lecturer by his audience.

Mr. Cohen dissented from the last speaker as to the expediency of increasing the length of the lectures, and was strongly opposed to the introduction of any discussion after them. It would be quite unusual, and would in most cases be objected to by the lecturers themselves. With regard to the hour of meeting, he thought the present one was, upon the whole, the most convenient.

Professor Tennant wished to draw the attention of the Council to the possibility of injury to the pictures in the great room from the gases produced at some of the chemical lectures.

Mr. Purling thought the lectures should not be lengthened. An hour was, in his opinion, quite enough for any lecture.

The Chairman said that, with regard to the length of the papers read at the ordinary meetings, he thought there would be some difficulty in shortening them to any considerable extent. His own experience led him to the conclusion that no subject of any importance could be properly dealt with in less than an hour. With regard to the Cantor lectures, he thought if they were extended much beyond the hour, the audience were apt to become impatient. As to the expediency of having a discussion after them, he agreed with Mr. Cohen that this would generally be objected to by the lecturers themselves. It should be remembered that opportunities for discussion were given at our ordinary meetings, the papers being prepared with that view, while lectures, on the other hand, were of a different character, being intended simply to afford information, and not to raise disputed questions. As to the expediency of making any change in the hour of meeting, he thought the matter worthy of careful consideration, which he was sure it would receive from the Council.

Mr. Teulon agreed with Mr. White as to the increased convenience that would result, especially to members like himself, who lived out of town, from holding the meetings at an earlier hour. He might take this opportunity of saying that, having been one of their treasurers during the past year, he desired to bear testimony to the accurate and clear manner in which the accounts were kept. He had gone through them with great care, and could speak confidently on the subject.

A vote of thanks having been passed by acclamation to the Chairman for his valuable services during his three years of office,

The Chairman, in acknowledging the compliment, expressed the pleasure he had experienced in promoting the Society's objects during the long term for which he had had the honour of being Chairman of the Council. He should still, as a member of that body, be anxious to do all in his power to further the Society's interests and promote its usefulness.

The ballot having remained open one hour, and the scrutineers having reported, the Chairman declared that the following members had been elected to fill the several offices. The names in *italics* are those of members who have not during the past year filled the offices to which they have been elected:—

COUNCIL.

PRESIDENT.

H.R.H. the Prince of Wales, K.G.

VICE-PRESIDENTS.

Edward Akroyd, M.P.
Lord Berners.
W. H. Bodkin (Assistant Judge).
Sir J. P. Boileau, Bart.
The Earl of Caithness.
Harry Chester.
Henry Cole, C.B.
Lord de l'Isle and Dudley.
The Earl Granville, K.G., F.R.S.
William Hawes.
C. Wren Hoskyns.
Lord H. G. Lennox, M.P.
Lord Lyttelton.
Right Hon. Sir John S. Pakington, Bart., M.P.
Sir Thomas Phillips, F.G.S.
The Marquis of Salisbury, K.G.
Sir Francis Sandford.
Sir J. Kay Shuttleworth, Bart.
Thomas Twining.
Vice-Chancellor Sir Wm. Page Wood, F.R.S.

COUNCIL.

John Bell.
Professor Bentley.
D. Roberton Blaine.
John Bailey Denton.
James Easton.
Peter Graham.
Henry Maudslay.
J. Slaney Pakington.
Colonel Scott, R.E.
Benjamin Shaw.
Alderman Waterlow.
Geo. F. Wilson, F.R.S.

TREASURERS.

W. T. Mackrell. | Seymour Teulon.

AUDITORS.

John Murray. | Philip Wright.

SECRETARY.

Peter Le Neve Foster, M.A.

FINANCIAL OFFICER.

Samuel Thomas Davenport.

At the conclusion of the General Meeting a Special Meeting was held, when the following candidates were balloted for and duly elected members of the Society:—

Adams, John, 391, Strand, W.C.
Adamson, Daniel, Newton Moor Iron Works, Hyde, near Manchester.
Bones, John, Clarendon House, Maida Vale, W.
Calley, Samuel, Brixham, Devon.
Freeman, John, 3, Wigmore-street, W.
Haines, Edmund Napoleon, Dartford, Kent; and Maidstone Wharf, Upper Thames-street, E.C.
Hirst, John, jun., Dobcross, near Manchester.
Hulett, Lieut. C. H., Royal Artillery Barracks, Aldershot.
Lawson, William Thomas George, Freetown Cottage, Norfolk-road, Dalston, N.E.
Messent, John, 429, Strand, W.C.
Nairn, Michael B., St. Mary's Priory, Kirkcaldy, N.B.
Papillon, Philip Oxenden, Colchester.
Paraire, Edward Lewis, 36, Mornington-crescent, N.W.
Patrick, H. W., 18, Broad-street, Golden-square, W.
Pembroke, James, 8, Austin Friars, E.C.
Rothwell, William, Clare-place, Halifax.
Rowett, William, 9, Bush-lane, E.C.
Saunders, Thomas Harry, Dartford, Kent; and Maidstone Wharf, Upper Thames-street, E.C.

FINAL EXAMINATION, 1866.

In the "List of Certificates" given in the *Journal* of the 8th instant, a 3rd class certificate in Chemistry was, owing to the number not having been clearly written on the candidate's paper, awarded in error to "No. 1045—Thomas Jones, of the Salford W. M. Coll.," instead of to No. 1048—Langridge, Daniel, 31, Salford W. M. Coll.—in a chemical works.

Proceedings of Institutions.

Shrewsbury Institution.—The report for the last year congratulates the members upon the continued prosperity of the institution; the list of subscribers (the total number being 490) shows a falling off in the total number of about 60, but most, if not all of these, were persons who joined the society in the last quarter only of 1864, and under the special inducement offered of full privileges of membership during that term, at

he low rate of three shillings. The present roll of ıbscribers, if it can be kept up, will be sufficient to ıaintain the institution in a sound state of efficiency. 'he cash account shows that the income of the society uring the past year has been £634 4s. 11d., and the xpenditure £732 14s. 2d., the excess of the latter over ıe former being about £100, which was paid out of the ırge balance in the treasurer's hands at the commence-ıent of the year. Of this £100, one-half was spent in ooks added to the library, the other in improvements ıd purchases of an exceptional nature, such as furni-ıre and necessary alterations in the building. In pril, 1865, the directors placed the sum of £100 at terest in the Salop County Savings Bank; this amount ıey hope to leave untouched, to provide against any ntingency that may arise. The library during the ıst year has received the promised large accession of w works, and has otherwise been put in good working der. The directors observe with some regret that, stead of the profit anticipated upon the lectures and tertainments as heretofore, they have experienced a s from this source to the extent of £40 19s. 1d., and to this sum be added rent of room and gas, the total ficit on account of lectures would exceed £60. This rcumstance is the more to be regretted, because the aviest losses occur upon the lectures given by lec-rers of a high class. The business connected with e institution, and especially that arising out of the ınagement of the music hall, has become so large, at a paid secretary has been appointed, at a salary of 100 ineas.

ITISH ASSOCIATION FOR THE ADVANCE-MENT OF SCIENCE, 1866.

The thirty-sixth meeting will commence on Wednes-y, the 22nd of August, at Nottingham, under the sidency of William R. Grove, Esq., Q.C., F.R.S. e Local Secretaries for this meeting are—Dr. Robert-, Edward J. Lowe, Esq., F.R.A.S., F.L.S., Rev. J. M'Callan, M.A., Exchange Hall, Nottingham; and Local Treasurer is I. E. Wright, Esq.

The General Committee will meet on Wednesday, 22nd of August, at one p.m., for the election of tional officers, and the despatch of business usually ught before that body. On this occasion there will presented the report of the Council, embodying their oceedings during the past year. The General Com-ttee will meet afterwards by adjournment.

The first General Meeting will be held on Wednesday, 22nd of August, at 8 p.m., when the President will iver an address; the concluding meeting on Wednes-r, the 29th of August, at 3 p.m., when the Association l be adjourned to its next place of meeting.

At two evening meetings, which will take place at .m., discourses on certain branches of science will be ivered.

There will also be other evening meetings, at which ortunity will be afforded for general conversation ong the members.

The Committees of Sections will meet daily from Thurs-, the 23rd of August, to Wednesday, the 29th of gust inclusive, at 12 a.m. precisely.

The Sections will meet daily, from Thursday, the 23rd August, to Tuesday, the 28th of August, inclusive, 11 a.m. precisely.

Reports on the progress of science, and of researches rusted to individuals and committees, and other com-nications intended for presentation to the Sections, expected to be forwarded in letters addressed to the istant General Secretary, at Nottingham, previously the meeting, accompanied by a statement whether author will be present, and on what day, so that business of the Sections may be satisfactorily ar-ged.

The reports complete, and concise abstracts of other ımunications, are to be delivered to the Secretaries of the Sections before which they are read, previously to the close of the meeting, for publication in the Transactions. As the reports on science may be interesting to more Sections than the one which originally called for them, it is desirable that the authors should be prepared to furnish the means of reading them in any other Section at the request of the President and secretaries of that Section.

The following are the titles of the Sections to which communications may be presented:—

Section A. Mathematics and physics.
" B. Chemistry and mineralogy, including their applications to agriculture and the arts.
" C. Geology.
" D. Biology.
" E. Geography and ethnology.
" F. Economic science and statistics.
" G. Mechanical science.

On and after July 30, until August 17, life members who intend to be present at the meeting may receive their tickets by applying to the General Treasurer, and returning to him their life member's invitation circular; annual subscribers who wish to receive their tickets must return their invitation circular, with £1 enclosed, to the General Treasurer, W. Spottiswoode, Esq., 50, Grosvenor-place, London, S.W.

The Executive Committee at Nottingham will elect new members and associates on the usual conditions.

Ladies may become members on the same terms as gentlemen. Ladies' tickets (transferable to ladies only) may be obtained by members on payment of £1.

After August 17, personal application for tickets must be made at the Reception Room, Nottingham, which will be opened on Monday, August 20th. The Reception Room will be kept open for the issue of tickets not later than 8 p.m. on *soirée* evenings, and not later than 6 p.m. on other evenings.

Gentlemen who have in any former year been admitted members of the Association may, on this occasion, renew their membership, without being called upon for arrears, on payment of £1.

EFFECTS OF DENSITY OF POPULATION AS REGARDS FEVERS.

The demolitions in Paris have given rise to the reconsideration of some curious facts and theories respecting fevers. It is well known that in marshy districts intermittent, paludal, or marsh fevers assume a regular or periodic character. They reign constantly in the marshy lands of the Campagna of Rome, and they appear at times in places not ordinarily subject to them. This happens frequently, almost invariably, when the plough is first put into virgin soil, when great forests are cleared, or when extensive excavations are made in inhabited places.

It has been remarked as extraordinary that so little effect of the kind has been produced by the demolitions and excavations which have attained so much importance in Paris during the last few years. The soil has been largely disturbed at an immense number of points in the city, and subterranean works have been carried on at the same time to a proportionate extent, yet the cases of intermittent fever are said to be rare. To what is this immunity to be attributed? Dr. A. Tripier, of Paris, has taken up the question, and says that he only knows one reply that has been hazarded, and that was from M. de Tournon, the Prefect of Rome at the commencement of the present century, respecting the territory under his charge. In a work entitled "Etudes Statistiques sur Rome et la partie occidentale des Etats Romains,"* M. Tournon says, "It is universally known that in the territories which include the basis of the lakes of Bolsene, of the Tiber, and of

* Paris: Firmin Didot.

the Pontine marshes, in certain parts of the Sabine valleys, and at some points of the valley of the Sacco, as well as in all that part of Tuscany known as the Maremme, intermittent fevers appear regularly in the period commencing with June and ending with September, often become violent, carry off numbers of the inhabitants, and leave still more marked with the symptoms of persistent disease. It is a fact, moreover, that in this vast region there are scarcely any isolated dwellings, and those which exist are deserted during the summer season; the fevers are less frequent in proportion to the size of the village, and in Rome itself they only appear in the more sparsely populated portions of the city, and do not touch the thronged quarters." The neighbourhood of stagnant water does not, according to M. Tournon, exercise much influence on the sanitary condition of the population, for the highest and driest parts of the plain between Rome and Tivoli and Rome and Frascati, for example, are almost as unhealthy as the borders of the marshes of Ostia or of Marcaresa, and less healthy than certain points of the banks of the lakes of Boleno or of Bracciano. It is known also, that the sanitary condition of each locality is liable to variations; thus in Rome, the quarters dei Monti, del Borgo, and di Trastevere are generally considered as very healthy, yet at the present moment the fever is raging there and driving out the inhabitants. The mounts Cœlius, Aventino, and Janicule are actually uninhabitable, yet Titus Livy calls them *Saluberrimos Colles*. The Strada Pia, bordered by palaces and convents, is no longer inhabited without anxiety in its upper portion, and yet the Papal Summer Palace of the Quirinal stands at its entrance towards the city. The Piazza del Popolo is now unhealthy, and the streets giving on it, although reported healthy, are suffering from fever. Thus you may pass, almost insensibly, from a healthy portion of a city to one quite the reverse, but the danger invariably diminishes in proportion to the density of the habitations. "I recommend to the attention of the reader," says M. Tournon, "these remarkable facts, that the miasma gives way in presence of the agglomeration of the buildings; that the closer they are together the less are its effects: and that the centre of a town presents the maximum of security. Moreover, whenever a village begins to be depopulated, no matter from what cause, the malaria first attacks its outer parts, advances as the houses are emptied, lays siege to the inhabitants, pursues them towards the centre, where it attacks them when they are too much diminished in numbers to repel the germs of death by congregation."

After having enumerated the ravages caused by the malaria, M. Tournon shows, from historical data, that those parts of the Pontifical States which were unhealthy in 1810, as they are now, were formerly covered with habitations, and were salubrious; that the Etruscans, the Sabines, and the Latins covered this part in such numbers that there are enumerated fifty-three nations between the Tiber and the Liris, besides a large population between the Liris and the Fiord. After Rome had commenced forming a territory at the expense of her neighbours, matters did not change much during the first five centuries; but that at a later date, when the local population had been destroyed, and the Romans had been drawn off in great numbers by incessant wars, unhealthiness began to arise from the depopulation, and from the substitution of pasture for arable lands; and that, at a still later period, when Rome herself suffered from civil war, as well as from the evils of foreign expeditions, the depopulation became complete, and the insalubrity grew rapidly to nearly what it is in our time.

Dr. Colin, formerly professor in the French School of Medicine, has likewise studied the subject at Rome, and adopts M. Tournon's view with respect to the influence of density of population on the fevers produced by malaria.

It is certain, says Dr. Tripier, that during the last fifteen years, Paris ought, then, theoretically, to have suffered from intermittent fevers, if some influences were not at work to counteract that of the malaria. It cannot be said that, from the point of view in question, the disturbance of the soil of a town differs in any respect from the like disturbance in any other place; and it is observed that where the inhabitants are driven away, cases of periodic fever do make their appearance from time to time in the neighbourhood of those places where large public works are in hand.

Dr. Tripier says it is difficult to avoid arriving at the same conclusion as M. Tournon respecting the preservative influence of density of population in the case of the fevers in question; but he evidently does not accept the proposition of M. Tournon, that stagnant water has no special influence in such cases. Nor does he fail to remark that however density of population may be good against the influence of intermittent fevers, it is certainly not so, but precisely the contrary, as regards the great part of other pestilential diseases.

Fine Arts.

THE PARIS SALON AND MEDALS OF HONOUR.—Th annual exhibition of works of art, or *salon* as it is call and which has already been spoken of in the *Jour* has created universal interest this year—not on acco of its intrinsic excellence, or of its extent—for the nu ber of works was less than it was last year, and certai the quality, or at any rate the number of import works was not extraordinary—yet on Sunday, the 17 June, admission being gratis on Sundays, the number visitors is reported to have reached 70,000. The inte taken by the public in the annual exhibition gro doubtless, with the increasing interest in all subj connected with art in France, and this has been gr fostered by the encouragement and patronage of th Government, and by the multiplication of societie the exhibition of pictures, statues, and other product The interest felt by the artistic world is also gr stimulated by those causes to which the new syst popular election of the juries, and the trusting of award of the two great medals of honour to the body decorated artists, has no doubt added a new imp In the *Journal* of the 8th inst. was given the result the first voting for the two medals of honour; since t notice was written the matter has been decided, and effect is, that no grand medal is to be given this y Of the 506 artists entitled to vote in this case, 197 t part on the first occasion, 175 on the second, and on the final trial. As already stated, the ten artis the head of the poll on the first occasion bec the only candidates on the second trial, and result was as follows:—Bonnat, historical painter, tained 49 votes; Carpeaux, sculptor, 38; Corot, la scape, 23; E. Lévy, poetic, 20; Gumery, scul 20; Auguste Bonheur, landscape and animals, 19; Robert-Fleury, history, 15; Fromentin, landscape, Gérome, history and *genre*, 8; and E. Dubufe, poetic votes. At the last and final voting, M. Bonnat obt 50 votes, M. Carpeaux, 49; and M. Corot, 32, while voters expressed their opinion that no work deserv grand medal this year, and seven wasted their votes inserting some name not in the list of candidates. M objections have been raised against the new regul with respect to these great medals. On the one hand is contended that the register is much too limited, that all exhibiting artists should have a vote, wh they themselves have been found worthy by for juries of a distinction of any kind or not; this of co would include a great number of young men wh artistic powers are small and whose judgment is prob no greater, and who would very possibly form a maj of the whole voters. The objection that the vari classes of artists, painters and sculptors, those who history, or landscape, or poetic subjects, vote for one

their own class, seems fairly balanced by the accusation of a jealous feeling against a rival; and there is good reason to believe that *amour-propre* is certainly as strong an incentive as *camaraderie* or *esprit de corps*. It is not probable that so novel an arrangement will satisfy all parties, and, considering the small amount of experience the world has yet had in such matters, it is safer to look at results than to dogmatize upon so-called principles which, to say the least, are far from being beyond question. It may be affirmed almost absolutely that the painter who received the largest number of votes exhibited one of the two best historical works, the other being the "Warsaw" of M. T. Robert-Fleury, who was also one of the chosen ten; secondly, the author of the most remarkable piece of sculpture was only one step below his competitor; thirdly, M. Corot, although many object to his monotonous, grey style of treatment, undoubtedly stands in the very first rank of landscape painters. The Emperor has just purchased one of M. Corot's works in the exhibition for 18,000 francs (£720). Another argument in favour of the decision of the artist voters is that they are certainly perfectly in accord with the majority of the critics and of the artistic world of Paris in the opinion that no work exhibited this year presents sufficient importance to entitle the artist to a grand medal of honour. Looking at the results, therefore, there is little ground of complaint against the arrangement as it stands at present, and not much chance of improving it; while the education of the judgments of artists, and their induction, as it were, into the public life of their own world is a matter of such interest to art that any improvement in the system should be hailed with satisfaction. Any rash step that might cause the abandonment of the experiment would be a lamentable error.

Manufactures.

MOROCCO MANUFACTURES.—In the list of productions of Tetuan, fire-arms take first rank. There are thirty-eight master gun-barrel makers, who employ about 230 men; there are twenty-eight master gun locksmiths, assisted by about 112 under workmen; and there are forty shops where the barrels and locks are mounted on stocks. In all these departments great credit is due to the manufacturers, for the work they turn out is surprisingly good. Last autumn the Sultan sent to Tetuan two patterns of muskets with percussion caps, such as were of late years used in the English and French armies, with orders that two of each kind should be manufactured for his Majesty as a trial. The order was executed with such intelligence that the Sultan has now directed that no more guns on the old Moorish patterns be furnished him from Tetuan, and he has commissioned the manufacturers to supply the whole of his regular troops with the new musket. The British Consul, who examined the Moorish muskets by the side of their European pattern, states that the former surpassed, both in strength and finish, the originals. The barrels are all subjected to a very powerful proof, and each arm is turned out complete at a cost of £1 4s. The original Moorish arms are also manufactured with extreme care, and the costly ones are damaskeened and otherwise decorated with real artistic taste. Besides the gunsmiths' shops there are thirty-six forges, where the blacksmiths' work for the regiments of Tetuan and for the interior of Northern Morocco is carried on. The following is a list of the number of hand-looms employed in Tetuan in the manufacture of several kinds of textile fabrics:—

	Looms.
Coarse woollen cloth used as outer clothing by the natives	225
Fine white woollen cloth shaicks	145
Blankets	34
Cotton cloth and napkins	32
Linen cloth and napkins	30
Woollen sashes	34
Silk and gold tissue	10
Silk head-dresses	9
Rush mats (very pretty)	45
Total	564

Three tan-yards, with 103 master tanners, partially supply the shoe-trade of the place with both sole-leather and red and yellow morocco skins. The shoemakers' shops number 140, and have always an excess of work, as the demand for Moorish slippers for the Egyptian market is constantly increasing. The potteries of Tetuan are also of considerable importance in Morocco, and the clay found here is much superior to any used in the English potteries. The geometrical-shaped and many-coloured tiles which are so conspicuous an ornamentation of the Alhambra at Granada, are still manufactured here, and add much to the beauty of the houses of the Moorish grandees. A Tetuan Moorish gentleman visited some years ago Malaga, and was surprised to find in its neighbourhood potters turning out utensils in the same manner and shapes as those in his native town. He had the curiosity to ask one of the Spanish potters his name, and was greatly astonished to hear him pronounce the Moorish surname of one of the principal master-potters of Tetuan. Besides the foregoing trades and manufactures, there are several other minor branches of industry in which Tetuan competes to advantage with other towns of Morocco; for instance, in gold embroidery on leather and velvet, arabesque paintings, for the ornamentation of houses and furniture, sieve-making, dyeing, and brass-founding.

Commerce.

INSECT WAX.—The trade in this article in China is large. In 1864, from the single port of Hankow alone, 5,100 cwt. were exported. It is taken by the Chinese as medicine, but is principally used as stearine in the manufacture of candles. It is one of the most valuable of the many products of Sze-Chuen, being worth 60 and 70 taels per picul (133 lbs.). The wax is deposited, for the protection of its eggs, by an insect which inhabits the trees on which the wax is secreted. The formation of the wax was a subject which occupied the especial attention of M. Simon, a French savant, who, a year or two ago, passed a considerable time in the interior, during which he is said to have traversed the greater portion of Sze-Chuen, and to have reached the eastern confines of Thibet. It is to be hoped the result of his researches into the products of the former fertile province will ere long be made public. A short report has already appeared in the *North China Herald*.

REFUSE TEA.—According to the last consular reports, it would seem that the tea dust and stalks, which formed the principal ingredients in brick tea, which was formerly shipped largely to Russia, are now being directed to this country. This tea dust is the refuse remaining after the packing of the tea, and is worth from 5 to 7 taels per picul. A portion is disposed of for local consumption in Shanghae, but it is principally shipped to England, where it is said to meet with a ready sale. In 1864, 5,288 piculs of 133 lbs. were shipped from the port of Hankow alone.

CHINESE SUGAR.—From the port of Amoy the average export of sugar in 1863 and 1864 was 89,000 piculs, but in consequence of the existing troubles the cultivation of the sugar cane is much less attended to. At Ningpo there has been a great decrease in the shipments.

THE YIELD OF PETROLEUM in the United States during the last five years has been as follows:—1861, 24,000,000 gallons; 1862, 40,000,000; 1863, 70,000,000;

1864, 87,000,000; 1865, 91,160,000. The product is now 14,000 barrels a day.

Beetroot Sugar in the United States.—The *Toronto Weekly Leader* gives the following information on this subject:—"In the United States attempts have been made at various times to start a trade in the manufacture of beetroot sugar, but the results have not yet reached any very extensive proportions, nor have they been attended with much success. In 1862 some Germans commenced the business of growing beet and making sugar in Chatsworth, Illinois. The late war, however, ruined the business, but not until ten tons per acre of the beets had been produced on 100 acres (a yield less than half of the average yield in a good season in France), and some 8,000lbs. of sugar was manufactured. This identical tract, including about 2,300 acres of land, has recently been procured by a regularly organised association or company, who sent an agent to Germany last winter for suitable machinery and apparatus, and for a supply of seed. This season, at least 600 acres of the above tract will be planted with beets. The manufacturing process will be superintended by one of the original German proprietors. This effort is the most feasible and systematical of any that have yet been made, and we are inclined to look for satisfactory results. We do not know what variety of beet has been made use of; the white Silesian is the variety used in Europe, and it would probably be successful here. It furnishes in its pulp almost as much food for animals as the turnip or mangel wurzel, and gives at the same time a large proportion of sugar. It will be difficult in this country, where labour is scarce and so many enterprises are on foot which yield large profits to capital, to concentrate the time, the patience, and the capital upon an object of this kind, which are necessary to its successful development. Time will, however, demonstrate its advantages; and will, we hope, make this continent an active competitor with Europe in the business of supplying the world with sugar. The principal difficulty suggested by the experiments made was, that the soil and climate of the north-western States do not ripen the beet suitably for the profitable manufacture of sugar."

Imports of Bones.—Baron Liebig, some time since, energetically protested against England's consuming such an enormous quantity of bones, but the imports last year amounted, nevertheless, to 74,307 tons, and in some years they have reached nearly 85,000 tons. They are principally used for manure and for charcoal for the sugar refiners.

Coffee Statistics.—The following statistics, relating to the importation of coffee into Great Britain, are from M. Sabonadière's treatise on Coffee-planting in Ceylon:—"In the ten months ending 31st October, 1865, 107,250,000 lbs. of coffee were imported into the United Kingdom. In the corresponding period of last year, the quantity was not so large by 14,750,000 lbs. Of the total imports, Ceylon contributed 68,000,000 lbs; other British possessions, 18,500,000 lbs.; Brazil, 9,250,000 lbs.; Central America, 4,250,000 lbs.; and all other foreign countries, 7,250,000 lbs. The quantity on which duty was paid in the first ten months of the past year, 1865, amounted to 25,750,000 lbs., which is a diminution, in comparison with last year's return for the same period, of 772,869 lbs. A gradual decline in the consumption of coffee has taken place within the last four or five years, and is attributable in part to the greater demand for chicory, and in part to the increased liking for tea. Of Chicory, it may be observed that last year 99,564 cwts. were entered for duty, whereas in 1862 the amount was only 9,883 cwts., notwithstanding that the rate of duty had increased in the interval from 12s. to 12s. 6d. per cwt. The quantity of coffee exported from this country in the same months of this year was 82,000,000 lbs., or nearly 17,000,000 lbs. in excess of the shipments for the like period in 1864; Holland, France, Hanse Towns, Russia, Prussia, Belgium, Italy, Austria, and Turkey having been the principal customers. In the bonding receptacles, the stock on the 31st October last was 30,250,000 lbs., or about 4,000,000 lbs. less than on the same day in 1864.

Colonies.

Bismuth in New Zealand.—An Auckland paper says:—"It has been now ascertained that large deposits of this valuable metal exist in this colony, but its intimate association with copper renders its reduction by smelting on a commercial scale quite impracticable. Both metals may, however, be separated by dissolving the ore in nitric acid, and precipitating the bismuth first and afterwards the copper both in fine powder, but the cost is prohibitory except as an experiment. The attention of two of our colonists has been for some time drawn by it, and they have, after much trouble, succeeded in discovering a solvent, by which means they extract, in the first place, all the copper in a pure metallic state, and afterwards the bismuth, without the slightest alloy from other metals. The process is described as very economical, easy, and capable of being carried out by ordinary manual labour."

New South Wales.—Immigration.—By a parliamentary return it appears that this year there has been a great increase in the number of immigrants who have come with a view to farming operations. By a return under the Crown Alienation Act, in January, 1865, the purchasers were 98, and the area 5,727 acres; the number in January, 1866, was 414, and the area 48,496 acres. Again, in February, 1865, there were 164 purchasers, the area 11,000 acres; and for the same month of 1866, purchasers 363, and area 30,000 acres. From the southern districts there is a complaint of want of employment, and it is said the unproductiveness of last, and bad prospects of the approaching season, are telling severely on the working population. At the same time the gold-fields have ceased to absorb any appreciable quantity of labour.

The Intercolonial Exhibition.—A Melbourne paper says that the arrangements are steadily progressing, and there is now every prospect that the exhibition will embrace a full representation of the products of the different Australian colonies. The Tasmanian Government has promised to assist the Melbourne commission. A similar step has been taken by the Queensland Government, and the articles that are to be forwarded from that colony will be previously exhibited in Brisbane. The only colonies whose action appeared to be rather lukewarm were New South Wales and South Australia, and accordingly it was resolved, at a meeting of the Melbourne commission, to send deputations to Sydney and Adelaide, and to urge upon the Governments the necessity of contributing liberally towards the forthcoming exhibition, and also to arrange the basis of a plan by which the Australian colonies may be grouped in one department at the Paris Exhibition in 1867. Two commissioners have proceeded to Adelaide, and their efforts have been attended with considerable success, and there is every likelihood that South Australia will be adequately represented at the exhibition. The commission appointed by the Tasmanian Government comprises sixteen of the leading names in the colony, and a grant of £500 has been promised by the authorities to enable them to carry out the undertaking. At the last meeting of the Melbourne commission, the secretary stated that applications for space were steadily coming in. It was agreed at the same meeting to act as the commission for the management of the Victorian products for the Paris Exhibition of 1867. The secretary suggested that the products of the Australian colonies should be put, as in Melbourne, in one group, not as in London, where they were divided by walls. There are many sound reasons in support of this proposal, the chief being the gain of space and the enhanced effect in the aggregate by such combination.

The Commissioners for the Paris Exhibition have organised committees and addressed circulars to a large number of influential persons in all parts of New South Wales, with a view to facilitate the collection of specimens of the arts, manufactures, and products of the colony for exhibition at Paris in 1867.

Obituary.

Louis Etienne Watelet.—One of the patriarchs of the French school of painting, Louis Etienne Watelet, died recently, at the age of eighty-six. In his time M. Watelet had a high reputation, but the present generation scarcely knew him. He is looked upon as the father of the picturesque school of French landscape painting. He was the pupil of Bidaud, but he soon quitted the routine style to which they were bound, and studied for himself in the valleys of Switzerland and Savoy. If Watelet had never painted anything himself he would deserve to be remembered as the first master of Paul Delaroche, and as the adviser of Troyon, Paul Huet, Lapito, Corot, Aligny, Thuillier, Desgoffe, de Fontenay, who, with many others, worked in his studio. It is remarked that all his pupils remained original in their various styles, which would seem to prove that Watelet taught young artists how to see, think, and act for themselves; and it would be difficult to say anything more laudatory of a teacher. Watelet received his first medal in 1810, a first-class medal in 1819, and in 1825 the Cross of the Legion of Honour. His works, and even the artist himself, were forgotten or unknown by the great majority of the world of art, but Watelet was a thorough enthusiast, and, when the world had given him up, continued to paint out of pure love of his art; but of late years he would never allow his pictures to be seen except by his intimate friends. He would not, he said, make a public exhibition of a talent in decline.

Notes.

Dr. J. D. Hooker, of Kew, has been elected cor-esponding member in the section of botany, in place of is late father, Sir William Hooker, by the French cademy of Sciences.

Racing Prize.—The French race-course commission as voted the sum of ten thousand francs (£400) for an bject of art to form the Paris prize of the spring races f 1867. The competition is open to French artists and thers residing in France. The sketches are to be sent before the first day of July, and the work is to be xecuted and delivered by the first of March next.

Horse Flesh for Food.—The Prefect of Police of aris has issued an ordinance recognising and regulating e use of horse flesh for human food. Considering, says e document, that the flesh of the horse has been introuced into consumption in several countries without aprent harm, the sale of horse meat as food is permitted the following conditions:—That special slaughterouses be established. That no meat be sold by the dinary horse-slaughterers. That the animals whose sh is to be eaten be killed in the presence of a veteriry inspector. That the pieces shall be stamped. All nhealthy horses are excluded. At every place where ch meat is sold the fact must be indicated by a placard. ll restaurateurs or others who make use of horse-flesh all be compelled under penalties to inform their cusmers of the fact.

Protection of Trees from Insects.—The following nple method of preserving fruit from the ravages of sects is recommended by the Imperial Society of Pracal Horticulture of the Rhone, and by the director of e School of Arboriculture of the Parc de la Fête d'Or at Lyons. The quantity of fruit destroyed by insects that deposit their eggs in the blossoms is enormous. These creatures are said to have a great antipathy to vinegar, the mere odour of which is enough to drive them away, and, in some cases, to destroy them, and nothing more is required than to sprinkle the branches with a mixture of vinegar and water at the moment the blossoms begin to appear. The mixture recommended consists of one part of vinegar to nine parts of water, but as French vinegar is very strong, perhaps the amount of water should be less when English vinegar is used. When the liquids are well mixed, the solution is to be sprinkled over the flower-buds by means of a garden engine or syringe, or even with a watering-pot with a fine rose. M. Denis, the director of the school referred to, tried the experiment last year, and reports that fruit trees so treated were covered with fruit, while those to which the acidulated water was not applied bore scarcely any. The other remedy proposed is against ants and other insects which mount the stems of trees. Take common lamp-oil, and expose it in the sun for three or four days, or until it acquires a gummy consistency and very disagreeable smell, then with a small paint brush paint around the tree at about two feet from the ground a band of the oil two inches wide, repeating the operation for three or four successive days. It is said that this method will protect the tree for four years at least. Perhaps coal tar might be found to answer the same purpose.

Meteoric Stones.—At a recent meeting of the Paris Academy of Sciences, M. Daubrée made an interesting communication on meteoric stones which fell on the 30th of May in the territory of Saint Mesmin, in the department of the Aube. The circumstances are thus stated by M. Daubrée:—On the 30th May, about 4·45 in the morning, weather calm and only a few clouds in the sky, a luminous mass was observed, between Mesgrigny and Payns, which crossed the sky with extreme rapidity and threw a bright light over a great space. A few seconds after this apparition three loud explosions, like the reports of cannon, were heard at intervals of one or two seconds. These were succeeded by several explosions of less force, like the discharge of muskets, and following irregularly like the firing of two ranks of soldiers. In the midst of these detonations, which became gradually weaker, was heard a loud rumbling or rolling noise similar to that of thunder. According to information collected by M. Daubrée himself on the spot, the light and reports were seen by various persons between Montereau and Payns distributed over a space of more than forty miles. After the detonations a tongue of fire darted towards the earth, and at the same time a hissing noise was heard like that of a squib, but much louder. This again was followed by a dull heavy sound, which a person compared to that of a shell striking the earth near him. After a long search he perceived, at the distance of about two hundred feet from the place where he was when he heard the noise, a spot where the earth had been newly disturbed; he examined the place and saw a black stone at the bottom of a hole nine inches deep which it seemed to have formed. This stone weighs nearly ten pounds. On the following day a gendarme named Framonnot picked up another meteoric stone of the same nature, weighing nearly seven pounds, at about two thousand feet distance from where the first fell. A third stone was found on the 1st of June by a man named Prosat, five to six thousand feet from the two spots above referred to. This last meteorite weighs nearly four pounds and a half.

MEETINGS FOR THE ENSUING WEEK.

Mon......Entomological, 7.
Asiatic, 3.
Tues. ...Geologists' Assoc., 8.
Thur. ...Chemical, 8. 1. Mr. Schorlemmer, "Hydrocarbons in crude benzol, &c." 2. Mr. Thorp, "Use of metallic copper in organic analysis." 3. Dr. Williamson, "Constitution and representation of chemical compounds."
Fri ......Archæological Inst., 4.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 16th June*, 1866.

191. Bills—Local Government Supplemental (No. 3).
192. " Land Drainage Supplemental (No. 2).
345. Extradition of Criminals—Return.
346. Cattle Diseases (Ireland) Act—Order in Council.
Education—Report of Committee of Council.
Superior Courts of Common Law and Courts of Chancery (England and Wales)—Second Report of Commissioners.

Delivered on 18th June, 1866.

193. Bill—New Forest Poor Relief (as amended by Select Committee).
324. Inland Revenue (Scotland)—Statement.
337. Mails (West Indies)—Return.
341. Mails (Southampton and St. Thomas)—Return.
342. Education (Ireland)—Annual Report of Commissioners.

Delivered on 19th June, 1866.

308. Royal Hibernian Military School—Returns.
332. Art Union Laws—Report, Evidence, &c.
Paris Conference—Correspondence.
Jamaica Disturbances—Despatch.

Delivered on 23rd June, 1866.

194. Bills—Artizans and Labourers' Dwellings (as amended by the Select Committee).
195. " Waterworks (as amended in Committee, and on recommitment).
196. " Rochdale Vicarage (as amended by the Select Committee).
197. " Paupers (Scotland).
321. Police (Scotland)—Eighth Report of Inspector.
334. Parliamentary Boroughs (Liverpool, &c.)—Return.
351. Poor Law (Ireland)—Return.
Education (Revised Code) (Scotland)—Minute.

Delivered on 25th June, 1866.

333. Cheltenham Election—Minutes of Evidence, &c.
357. Population (Scotland)—Return.
358. Knaresborough, &c., Townships—Return.
Jamaica Disturbances—Papers laid before the Royal Commission by Governor Eyre.

Delivered on 26th June, 1866.

326. Rural Police—Return.
360. Cork, &c., Baronies and Towns—Returns.
361. Revenue Departments and Post-office Packet Service Estimate—Vote "On Account."

Patents.

From Commissioners of Patents' Journal, June 22nd.

Grants of Provisional Protection.

Aerial navigation—1571—F. H. Wenham.
Animals, shoes for—1360—W. Clark.
Boxes, paper and cardboard—1523—J. Linnett.
Bricks—1581—C. H. Murray.
Bridges—489—T. C. Boutet.
Carding engines—1583—J. Moss.
Casks, drawing liquids from—1520—T. J. Smith.
Cop-frames—1553—J. M. Tankard and J. Cockcroft.
Defences—1437—C. P. Coles.
Electric telegraphic despatches, transmitting—1521—J. H. Johnson.
Engines—1146—E. H. Huch and F. J. Windhausen.
Envelopes and paper bags—1554—J. H. Johnson.
Fabrics, woven—1155—E. Burles.
Fibrous materials, combing—1543—J. Lecoq.
Fibrous substances, cleansing—1532—A. V. Newton.
Fibrous substances, drawing and twisting—1542—A. A. Bois.
Fire-arms—1478—T. Boyle.
Fire-arms, breech-loading—1603—S. Bayliss.
Fore and aft sails, reefing and furling—1595—G. Allix.
Furnaces—1599—R. A. Wright.
Fuel, combustion of—1611—A. P. Price.
Gas—1468—E. Buchner.
Gas burners—416—J. J. Shedlock.
Girders—1544—C. Henderson.
Grains, treating—1445—E. Gripper.
Guns, breech-loading—1585—J. Erskine.
Hops, growing—1551—E. Farmar.
Horse rakes—1490—R. and R. Maynard, jun.
Horse shoes—1547—J. Sainty.
Hydrants—1525—H. E. Newton.
Irrigators—1557—T. W. Wedlake.
Kilns—1563—P. Righetti.
Knitting looms—1185—F. A. Renault.
Lanterns—1607—J. A. Forrest.
Lay figures—1579—D. T. Lee.
Locks—1597—F. W. Kurz.
Locks—1605—R. Lancaster.
Locks and latches—1545—J. B. Fenby.
Locomotive engines for common roads—1534—W. and J. Burrows.
Malt—1559—W. Lawrence.
Muffs—1561—L. Morris.
Oil, deodorizing—1522—J. H. Johnson.
Ordnance—1548—A. Moncrieff.
Paper-ruling machines, electro-magnetic striking attachments for—1569—J. G. Tongue.
Petroleum, furnaces for consuming—1593—S. Lees.
Pockets—1243—J. R. Towers, T. Clutterbuck, and J. B. Muschamp.
Portable mangle—1528—J. Clyne.
Power, transmitting—521—A. Moore.
Pumps and fire-engines—1566—H. Bateman.
Railway signals, self-acting—1540—J. Knight.
Railways—1458—J. Cooke.
Railways—1567—H. Greaves.
Railways, crossings for—1577—J. Armstrong.
Safes—1587—J. Baxter and J. Hunt.
Sawing machinery—1519—J. East.
Seats, covers or cushions for—1386—A. Cochrane.
Sewing machines—475—W. N. Wilson.
Sewing machines—1201—J. B. Robertson.
Shaving brushes—1517—A. R. Cunningham.
Shells, and in fuses used with shells—1555—C. A. McEvoy.
Ships' decks, fittings for—1372—W. Gerard.
Small arms, triggers for—1531—M. A. Caire.
Steam boilers—1535—S. Turton.
Steam engines—1530—J. Yule.
Steam engines—1601—G. D. Kittoe.
Steam pipes, discharging condensed steam from—1591—J. Seward.
Streets, &c.—1565—A. and W. Young.
Substances, jars for preserving—1573—W. E. Newton.
Substances, treating—1014—J. H. Johnson.
Sulphurets, reducing—1493—J. D. Whelpley and J. J. Storer.
Thrashing machines—1609—S. Kilby and G. Dixon.
Timekeepers—622—C. Powell.
Tools—1466—J. T. King.
Travelling bags, &c.—1575—C. D. Abel.
Vapours, generating and heating—1410—J. Bernard.
Vehicles, recording the distance travelled and the time occupied therein by—1513—W. Clark.
Vessels, propelling—1538—T. Neville and W. Gorton.
Waterclosets, &c.—1552—D. A. Dumuis, E. J. F. Filcoteaux, E. W. Niblett, and M. L. J. Lavater.
Water, engines for pumping—1539—A. B. Brown.
Weaving, looms for—1199—J. L. Davies.
Weaving, looms for—1558—J. Hopwood.
Weights, raising and lowering—1562—J. Loader.
Work to be operated upon, holding—1524—G. R. Mather.
Worts, treating—1560—W. Lawrence.

Invention with Complete Specification Filed.

Vulcanized india rubber, utilizing waste—1649—G. T. Bousfield.

Patents Sealed.

3338. J. Fisher.	3. N. Thompson.
3342. J. Rea.	12. P. S. Bruff.
3345. J. Young, jun.	137. E. M. Boxer.
3346. S. Griffith.	174. A. Bennett.
3356. S. and C. Collins.	653. W. Clark.
3369. A. Barclay.	887. J. Ramage and T. Nelson.
3378. A. and J. Knowles, and J. Barraclough.	991. W. Cooke.

From Commissioners of Patents' Journal, June 26th.

Patents Sealed.

3353. J. Bates, and E. and E. W. Brookes.	3381. J. S. Gisborne.
	1. J. Bullough & W. Rossetter.
3358. A. S. Brooman.	6. W. Barningham.
3366. T. Watson.	48. F. Tolhausen.
3368. A. S. Brooman.	75. J. Clunan & N. Nightingale.
3370. J. H. Kidd and J. C. Mather.	469. M. Henry.
3374. E. J. Hughes.	845. W. A. Dixon.
3376. R. Smith.	1151. J. M. Ryo Catteau.
3377. T. Parkinson.	1167. A. Borgnet.
3379. G. Hawksley.	1229. R. H. Hughes.
3380. R. Beck.	1331. H. Essex.

Patents on which the Stamp Duty of £50 has been Paid.

1524. J. A. Sparling.	1559. W. Clark.
1547. R. Brownlee.	1568. W. Rowan.
1570. W. L. and T. Winans.	1609. W. Clark.
1571. W. L. and T. Winans.	1563. A. Twaddell.
1572. W. L. and T. Winans.	1573. W. E. Newton.
1582. W. L. and T. Winans.	1588. W. Toovey.
1584. W. L. and T. Winans.	1580. T. F. Parsons.
1612. J. Griffiths.	1594. J. L. Hughes.
1543. T. Smith, T. Moore, and M. Burrell.	1589. S. Knowles and R. Hayward.
	1592. E. Myers & W. R. Williams.
1551. J. L. Clarke.	1601. J. O. Mathieu.

Patents on which the Stamp Duty of £100 has been Paid.

1512. G. C. Grimes.	1520. G. Redrup.
1517. J. Mills.	

Journal of the Society of Arts.

FRIDAY, JULY 6, 1866.

Announcements by the Council.

COUNCIL MEETING.

Wednesday, July 4th, 1866.

At the first meeting of the present Council since their election, Sir Thomas Phillips, Q.C., F.G.S., Vice-President, was unanimously elected Chairman for the current year.

Proceedings of the Society.

FINAL EXAMINATION, 1866.

The following addition must be made to the list of certificates already published:—452, Forster, James, jun., 18, Hull Young People's Institute, clerk—German (2d).

Proceedings of Institutions.

STOURBRIDGE ASSOCIATED INSTITUTE.—This comprises the Mechanics' Institution and the Working Men's Institution. The report of the former for 1865 says that the total number of members during the year has been 125, of which 45 are annual, and 80 quarterly, being a decrease of two quarterly members since last report. The income for the year, including a balance of £10 2s. 7½d., brought forward from last year, has been £71 12s. 7½d., and the expenditure £61 6s. 5d., leaving a balance of £10 6s. 2½d. in favour of the Institution. The librarian reports that he has issued the following works:—History, 89; memoirs, biography, and travels, 77; natural and mental philosophy, 9; moral and political philosophy, 11; natural history, 25; mechanics and the arts, 27; novels, 300; poetry, 29; magazines, 251; miscellaneous, 109; total, 927, being a decrease of 69 on the previous year. A box of books, containing 45 vols., belonging to the Worcestershire Union of Institutes, has been at the Associated Institute for a period of two months, and arrangements have been made to subscribe to Mudie's Library, by which 20 vols. of books, which may be exchanged once a month, are added to the library. A class for the study of political economy, conducted by the Rev. D. Maginnis, has been in operation during nine months of the year, with the exception of the usual interval during the summer season. A class for adult females has been successfully carried on, there having been an average attendance of 13. The prize of £1, given by the Right Hon. Lord Lyttelton, for Whateley's Easy Lessons in Money Matters, and a prize for mechanical drawing, both in connexion with the Worcestershire Union of Educational Institutes, were gained by members of the Associated Institute. An address by Mr. Jones, the Secretary of the South Staffordshire Association, on "The Advantages to be derived from the Society of Arts' Examinations," was made, and a lecture by Mr. George Dawson, on "Richard Cobden," was delivered in Union Hall. The committee regret that owing to the expense attending lectures, they find it impossible to arrange for such a number as they could wish. The annual accounts of the penny bank show that £238 9s. 1d. had been deposited, and £254 12s. 5d. paid to depositors, and that a balance of £121 was standing to the credit of the depositors. The managers have transferred their balance to the Post Office Savings' Bank. Delegates from the Associated Institute have attended several large meetings during the past year, calculated to promote the usefulness of educational Institutions, viz.,—one at Wednesbury, one at Willenhall, and one at Kidderminster. A festival of the members was held in the lecture-room of the Institute, and realized a profit of £1 12s. 4d., which sum was devoted to a special purpose. The annual *soirée*, in connexion with the Associated Institute, was revived this year, and under the management of a committee of ladies resulted in a net profit of £11 10s. 2d. The penny entertainments are still continued, and have resulted in substantial proofs of their popularity. The season of ten nights, previous to Christmas last, averaged in attendance nearly 600, and resulted in a profit of upwards of £17, in addition to £6 14s. 6d. realized on the last evening, which was devoted to the benefit of the Ragged School. The Entertainments' Committee have given a donation of £10 for the purpose of being expended on the library. —With regard to the Working Man's Institution, it appears that the number of members upon the books at the end of the year was as follows, viz.:—Annual, 19; quarterly, 21; monthly and weekly, 31; total, 71. The income for the year (including the balance brought forward and a donation of £10 from the Entertainments' Committee) is £35 2s. 2½d., and the expenditure £28 3s. 4½d., leaving a balance in the hands of the treasurer of £6 18s. 10d. The total number of volumes now in the library (including new books) is 844. The number of issues during the year is 953, which falls far short of last year. The following are the only classes that have been in operation during the year, viz., —The political economy class, under the superintendence of the Rev. D. Maginnis, and a class for female adults. conducted by ladies of the neighbourhood. One lecture only has been delivered during the year, by George Dawson, Esq., on "Richard Cobden." The committee, in concluding their report, "regret that although they have announced classes, provided teachers, and arranged other details, no response has been made by pupils joining such classes; and the experience the committee have had in providing lectures, leads them to think that lectures are not appreciated in the way they ought to be; that recreation, blended with intellectual amusements, are called for by the public rather than studies of a more solid and lasting character. The real aims of the Institution are not therefore attained so fully as could be desired. Although the committee do not pretend to point out the exact causes that are in operation, tending to hinder the carrying out the proper aims and objects of these Institutions, they cannot shut their eyes to the fact that educational institutions of this class are passing through a particular phase of their existence. On the one hand, a great cry if heard as to the necessity and desirability of educating the rising generation; on the other hand, this, and kindred institutions, offer great facilities for acquiring what is called for; but where are the youth, on whose behalf the cry is raised?"

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

ARITHMETIC.

THREE HOURS ALLOWED.

1. Find by practice the value of 319 cwt. 3 qrs. 16 lbs. at £2 12s. 6d. per cwt.

2. What will be the purchase money of an estate containing 191 ac. 3 ro. 37 po. at £47 17s. 7d. an acre?

3. If I gain 3s. 4½d. of profit on every guinea of outlay, what amount of outlay will gain £2 16s. 3d.?

4. If the carriage of 6 cwt. 2 qrs. for 124 miles cost

£3 4s. 8d., what weight should be carried 93 miles for £3 0s. 7$\frac{1}{2}$d.?

5. After I had gone $\frac{3}{8}$ of $\frac{1}{6}$ of twice my journey I had 10$\frac{1}{2}$ miles further to travel. What was the whole distance?

6. If 4 yards of wire $\frac{1}{16}$ of an inch thick weigh 6$\frac{1}{4}$ oz., what would 72 yards of wire $\frac{1}{24}$ of an inch thick weigh?

7. Two merchants join their capitals, which are such that for every £3 advanced by A, B puts in £4. At the end of 4 months A increases his capital by $\frac{1}{3}$, while B withdraws $\frac{3}{4}$ of his. What portion of a loss of £170 at the year's end should each sustain?

8. A sells at 3s. 6d. a gallon with 6 months' credit and 2$\frac{1}{2}$ per cent. discount; B sells at 3s. 5d. a gallon with 3 months' credit and no discount. How much per gallon does the one sell cheaper than the other, the use of money being equal to 10 per cent.?

9. A person bought goods for £40, and sold half of them at a profit of 5 per cent. For how much must he sell the remainder so as to realise 20 per cent. upon the whole?

10. A company has 50 ships averaging 375 tons each. In every 3 weeks 3 tons produce a clear gain of $\frac{3}{4}$ of a guinea, giving to each partner an annual income of £3,500. Find the number of partners.

11. The rent of a farm is a fixed sum, together with the value of a certain number of bushels of wheat; when wheat is 56s. a quarter the rent is £250, when at 60s. it is £260. What will it be when wheat is 80s. a quarter?

12. During the first six months of the year the income tax is at the rate of 7d. in the pound, and during the last six months it is at the rate of 5d. in the pound. If a person's income tax amounts to £21 what is his gross annual income?

13. To what amount must goods worth £1,200 be insured at 1$\frac{1}{2}$ per cent, so as in case of loss to cover the value of the goods and the premium?

14. A watch which loses 4 minutes daily is set right at 12 o'clock. What will be the true time a week afterwards when the hands point to 12 o'clock?

15. By selling apples at 8 for 6$\frac{1}{2}$d. a person gains 8$\frac{1}{3}$ per cent. What would he gain or lose by selling 3 for 2$\frac{1}{2}$d.?

16. A person borrows £163 6s. 8d. at 5 per cent. per annum, and at the same time £400 at 4 per cent. per annum. He repays altogether £581 9s. 2d. How long did he retain the money borrowed?

17. By transferring £5,000 stock from the 3 per cents at 72, to the 4 per cents, a person's income is increased £10. What is the market price of the latter stock?

18. A person invests £120 at the end of each year at 5 per cent. per annum. How much will this amount to at the end of four years, reckoning compound interest?

19. If the carriage of 1·875 tons for 60 miles be 9s. 4$\frac{1}{2}$d., what distance should 13$\frac{1}{2}$ tons be carried for 27s.?

20. Bought 50 barrels of porter and 60 of ale for £380, and sold the whole for £412, at a profit of 7 per cent. on the porter, and 10 per cent. on the ale. What was paid for a barrel of each?

BOOK-KEEPING BY DOUBLE ENTRY.

THREE HOURS ALLOWED.

1. What is book-keeping by double entry, as distinguished from single entry?

2. When is a ledger kept by double entry said to balance?

3. Can errors exist in a ledger that balances? If this be answered in the affirmative, support the answer by an example or examples.

4. If, on examining the books, it be found that the following entries, viz.:—

	£	s.	d.
Wine purchased of J. Smith	100	0	0
Discount allowed by me to J. Locke	6	4	0

have been journalized and posted as if they had been as follows, viz.:—

	£	s.	d.
Wine purchased of J. Smith	110	0	0
Discount allowed to me by J. Locke	6	4	0

set forth the journal entries necessary to correct the errors.

5. Journalize and post in proper technical form a[nd] language the following imaginary transactions, and ma[ke] out from the ledger a trial balance, a profit and lo[ss] account, and a balance sheet:—

John Ward takes W. Campbell into partnership on 1 January, 1866. John Ward's assets and liabilities are as follows, viz.:—

ASSETS.

	£	s.
Sherry	2,250	0
Brandy	300	0
Sundry debtors to him, viz.:—		
A. Green	200	0
J. Smith	50	0
T. Jones	100	0
Bills receivable	262	0
Cash	1,000	10

LIABILITIES.

	£	s.
Bills payable	150	0
Due to P. Robb	20	10
Due to F. Brook	132	4

W. Campbell's capital amounts to £2,000 cash.

N.B.—The capital and drawings of the partners [are] subject to interest at 5 per cent. per annum, and [the] balance of the profit and loss account is divisible thus: To John Ward, *two-thirds*; to W. Campbell, *one-third*.

1866.			£	s.
Jan.	1.	Paid cash for purchase of business premises	1,500	0
	,,	Advanced for petty cash	20	0
	2.	Received cash from J. Wilson, in payment of his acceptance due this day	62	0
	3.	Consigned to P. Walker, to be sold by him on our account and risk, brandy invoiced at	225	0
	,,	Bought of F. Brook, sherry	75	0
	4.	Paid cash for our acceptance of J. Ward's draft, due this day	150	0
	5.	Sold P. Robb brandy	20	0
	6.	Received A. Green's acceptance, at 21 days, in payment of amount due by him	200	0
	,,	Received cash from J. Smith	50	0
	8.	Discounted A. Green's acceptance for £200, and received cash £198, and allowed discount £2	200	0
	11.	Advanced for petty cash	30	0
	,,	Received from P. Walker on account of consignment of brandy	100	0
	12.	Lent cash to J. Smith	100	0
	13.	Sold sherry for cash	400	0
	,,	Sold sherry to A. Green	800	0
	,,	Received from A. Green his acceptance, due 16th April	800	0
	15.	Bought sherry of J. Potts	1,500	0
	,,	Paid cash to J. Potts on account	750	0
	,,	Accepted J. Potts' draft at 2 mos.	750	0
	17.	Bought brandy for cash	300	0
	19.	Cash drawn out by J. Ward	100	0
	20.	Received cash of T. Jones, by way of composition, in discharge of his debt of £100	50	0
	22.	Received account sales from P. Walker, showing that the above consignment of brandy to him realised net	285	0
	,,	Received cash from P. Walker, balance of amount realised, viz.	185	0

Jan. 24.	Paid cash for repairs of premises	10	6	0
25.	Sold for cash, brandy	150	0	0
26.	Paid cash for fire insurance.........	20	0	0
30.	Bought sherry from J. Potts	900	0	0
„	Paid to J. Potts, A. Green's acceptance, due 16th April.........	800	0	0
„	Paid cash to J. Potts	100	0	0
31.	Paid salary of clerk	10	0	0
„	Trade charges, paid out of petty cash	40	2	0
„	Interest on amount drawn out by J. Ward	0	3	4
„	Interest on J. Ward's capital......	16	1	8
„	Interest on W. Campbell's capital	8	6	8
„	Stock of sherry in hand	3,925	0	0
„	„ brandy „	100	0	0

ALGEBRA.

THREE HOURS ALLOWED.

1. Find the greatest common measure of $x^2 + x - 2$ and $x^2 + 3x + 2$, and also their least common multiple.

2. If S_i represents $\frac{a^i}{(a-b)(a-c)} + \frac{b^i}{(b-a)(b-c)} + \frac{c^i}{(c-a)(c-b)}$ prove that $S_0 = 0 \quad S_1 = 0 \quad S_2 = 1$.

3. Extract the square root of $13 - 4\sqrt{10}$ under the form of a quadratic surd.

4. Solve the equations:—

$$x - 2y + 3z = 10.$$
$$x + 3y + 2z = 25.$$
$$2x + y + 4z. = 30.$$

5. Sum the series $1 - 2 + 3 - 4 + 5$, &c., to 101 terms.

6. A farmer bought a flock of 60 sheep, of which three died, but by selling the remainder at 2s. per head more than he paid for them, he realised a profit of £1 10s. on the transaction. Find the cost price of the flock.

7. If a number contains n digits, prove that its square root contains $\frac{n}{2}$ digits if n is even, and $\frac{n+1}{2}$ if n is odd.

8. If a and b are the roots of the quadratic equation $px^2 - qx + r = 0$, prove the equality $\frac{1}{a} + \frac{1}{b} = \frac{q}{r}$ and if $a = b$ find the relation between p, q, r.

9. Distinguish between interest and discount, and show that the latter is half the harmonic mean between the former and the principal sum.

10. Show that in the expansion of $\frac{1}{(1-x)^n}$ by the binominal theorem, the $(n-1)^{th}$ is half the n^{th} coefficient for all values of n.

11. Supposing the odds to be 3 to 2 against A solving one of these questions, 2 to 3 against B solving it, and that it is an even chance that C can do so; find the chance that a solution will be obtained if all three try.

(To be continued.)

THE CAUSE OF SHIPWRECKS AND LOSS OF LIFE AT SEA.

BY J. W. WOOD, ESQ., BOARD OF TRADE RECEIVER OF WRECK, HARWICH.

The object of this paper is to touch upon some of the causes leading to shipwreck and loss of life at sea which may have escaped notice; the want of auxiliaries to existing means and appliances for the prevention or mitigation of such shipwreck and loss; and means supposed to be attainable to those ends.

It will, I dare say, be remembered that a deputation from the Social Science Association had an interview with the President of the Board of Trade, in February last, with the view of obtaining a Royal Commission of Inquiry into these subjects, but without the expected result.

My object in venturing to write publicly upon such important subjects at all, is simply to aid inquiry and discussion now taking place, by the relation of some practical experience, and also the introduction to notice and consideration of certain tested but comparatively unknown means and appliances available towards the ends in view, in the hope that good may result.

I invite attention:—

First—To the ignorance of a large proportion of our merchant seamen as one of the indirect causes leading to shipwreck and loss of life; to the importance of their improvement in this respect; and to the details of a means towards its attainment which has been already successfully tried on a small scale; then to some other causes which do not appear to me to have attracted attention; and,

Secondly—To the want of an auxiliary to present means for saving lives in cases of shipwreck, capable of being used either from the ship or from the shore, with the details of an invention introduced for the purpose, illustrated by diagrams.

First, with regard to our merchant seamen, on whose intelligence as well as bodily strength the safety of life and property at sea is, to no inconsiderable extent, dependent.

A service of many years on the coast in different parts of the kingdom, both as superintendent of mercantile marine, and receiver of wreck, has brought me much in contact with seafaring men of all kinds; and, considering that our mercantile marine is not only one of the most necessary and useful classes of the community, but that it would probably be England's chief bulwark in the hour of necessity, the importance of endeavouring to raise the tone and character of the men has from time to time engaged my attention.

That many of the disputes which occur between masters and seamen, causing inconvenience and oftentimes loss to owners, are the result of ignorance on the part of the men, my own experience could testify. The unavoidable haste in which crews are oftentimes got together and shipped, although the agreement they enter into is read over to them previous to their signing it, does not afford them much time for reflection, neither are the men always in a condition to reflect; and what can be the use of the copy of the agreement which is required by the Merchant Shipping Act to be made accessible to them on board, if they are unable to read it, and understand what they have really bound themselves to perform? It follows that, in too many cases, it is left to the interpretation of a black sheep among them, familiarly known as a Sea Lawyer, who manages to unsettle the minds of his mates for his own purposes or pleasure, which may not only cause general confusion and discomfort during a voyage, but, by weakening discipline, prove a great source of evil in the hour of danger.

That much of the thoughtlessness of our merchant seamen may also be attributed to ignorance will probably be conceded, but it is unfortunately not confined to men before the mast, for I have met with masters of coasting vessels barely arrived at middle age who could not write their names, while many others could only do so with much difficulty. It is not probable that their reading would be much better than their writing, in which case it is not difficult to conceive that their navigation would be of a rather haphazard description. I have seen this to some extent exemplified on taking depositions in cases of shipwreck (especially amongst men of the class alluded to), having found it to be not only most difficult to elicit anything like an intelligible version of the facts, but on asking an opinion as to what might be the cause of the casualty, I have found them to be *entirely* "at sea." It is not many weeks since that I met with the master of a collier on board a river steamer; and while conversing with him on the subject of one of those recent heavy gales which have been since found to have caused such fearful loss of life, he told me that he was out in it, and had had a narrow escape with his old craft. He had

lost his anchor and chain, which had been in use many years, but got safely into port during the night *somehow*, *he* didn't know how, but he supposed his "time warn't come yet." He had just been to a marine store dealer, and bought a new chain, &c. Seeing a piece of very old chain of various sizes linked together lying on the deck, I asked him if that was it? He said "Yes." When I observed. "You surely don't mean to put to sea with such a thing as that?" To which he replied. "Lor bless you; why not? The chain's a good chain enow, and a sight stronger nor the one I lost."

I would not have it inferred that the class of masters in the coasting trade is by any means *composed* of such men, but I fear they are still numerous, in spite of the improvements which have been effected of late years; and the loss of vessels commanded by them, as well as the too often consequent loss of life is not very surprising; indeed I have often been led to wonder that, great as it is, it is not greater.

May not those fruitful sources of danger and disaster, neglect of the lead, of the influences of tidal currents, and the non-observance of, or inattention to meteorological changes, also be attributed to a great extent to the causes I have mentioned?

The remarks I have made are of course not intended to apply in any degree to merchant commanders generally, especially of the certificated and upper class, of whom England may be justly proud. What I desire to show is, that although a vast amount of improvement has been effected in our mercantile marine of late, by means of the Homes, Savings Banks, and the Naval Reserve, still much remains to be done, and I think may be done at once with advantage, instead of deferring it till the present generation of boys have been converted into able seamen. It is not my object to point out all the evils attendant on the ignorance of our merchant seamen, and I will therefore conclude this part of the subject by detailing the practical result of my reflections upon it some time ago.

Considering that education, even of an elementary character, leads to self-respect and expansion of the reflective and reasoning faculties, I was induced to try if seamen could be led to accept it, and the result was sufficiently satisfactory and (as it appeared to me) demonstrative of the suitability of my plan for more extended adoption, to induce me to make it known by a letter in the *Shipping and Mercantile Gazette* of the 7th May, 1864, when the editor, in an able leading article on the subject generally, warmly commended it to the attention of the Government and the public. The following is an extract from the letter giving the details:—

"It has been a source of regret to me to see, on shipping and discharging crews, the large proportion of men who can neither read nor write, or, if able to read a little, are unable to write at all. That there is no insurmountable difficulty in the way of meeting this I feel tolerably certain, having (under many disadvantages) personally tried the experiment by opening an adult evening school during the six winter months, for the benefit of resident seafaring men and any sailors in port, who chose to avail themselves of it, when seamen, from youths of 17 to bald-headed middle-aged men (including naval reserve men on drill) availed themselves of it, and evinced such an earnest desire and endeavour to progress, as to afford me a pleasure which I am sanguine enough to hope others may also like to enjoy, and I therefore beg to offer the following concise description of the simple plan adopted:—Having obtained the use of a large room belonging to the Government, which was disengaged two evenings in the week, put a stove into it, obtained the loan of forms and tables, and laid in a stock of coals and candles, I sought and readily found suitable assistants in two of my subordinates, also a military officer, and a gentleman residing at the port, and had placards conspicuously posted inviting seafaring men above the age of 17 to attend at the well-known room, and intimating that every Tuesday and Thursday evening, from seven to nine o'clock, they might there receive instruction in reading, writing, and arithmetic, for which each person availing himself of it would have to contribute one penny towards the cost of coals and candles. Then borrowing and purchasing a small supply of books and stationary, I arranged the classes, taking the writing class myself as the most important for obvious reasons, especially as the readiest means of conveying the largest amount of general instruction, and selecting some pithy sentences of a useful tendency for copies, I wrote them on slips of paper, posting one of a different sized hand on each upper side of a small triangular piece of wood, so that two men writing on either of the military tables used, might, by simply turning the piece of wood, each have a fresh copy. After a time those who had made sufficient progress were formed into a class for writing from dictation, the selections being sufficiently interesting as well as instructive (while improving the reading and writing), to convey a considerable amount of useful information. This class provided their own writing books, which were corrected and returned to them every night for future reference; and it was exceedingly satisfactory to note the spirit of friendly emulation excited, and the rapid progress made. The other classes were conducted in what I believe to be the usual way. I never heard an unseemly or angry word on any occasion, and feel persuaded that there is a growing feeling amongst the men that such instruction is a boon. There may not be a free room available at every port, but I am much mistaken if the small amount necessary at starting might not be raised anywhere without difficulty; and if the foregoing, or some more perfect plan, should be tried, I have strong hopes that such schools would soon become general and self-supporting, especially if the promoter and head should be a man of authority and position, well-known to, and liked by, the seamen of the port."

Such was the simple course pursued, not only with satisfaction to myself, but I have reason to hope with benefit to others, and it has been a source of regret to me that, in consequence of the opening of an extensive Continental steam traffic at Harwich shortly after, my limited leisure became so entirely engrossed by official duties as effectually to prevent a continuance of it. Many a time have I been anxiously asked by some of my old pupils when I was likely to resume it, but I have been unable to do so.

Amongst the other causes which may not have attracted the attention they appear to me to deserve, I may mention the large masses of wreck which have been allowed to drift about in the fairway of ships, and being so low in the water as to be almost invisible at night, must be nearly as dangerous as sunken rocks, especially to steamers. How much damage, and oftentimes loss of life, may be occasioned by the whole or the half of a hull so drifting, before it is carried on shore by tidal influence, may be conceived. It may be said, "then why not remove it when within reach, as it generally is when the danger is greatest; the property would pay for it?" Tho reason is a very cogent one—the labour and risk in securing it are generally so great that the ordinary salvage reward which might be derived from the net proceeds of sale is often wholly insufficient as a remuneration, and salvors are led to pass it by for more certainly profitable employment.

I had a case of the kind to deal with a few years ago. The bottom of a vessel about 300 tons register was found drifting at sea off Aldborough, and 4 smacks, with 21 men, after unusual risk and labour in a heavy sea, succeeded in towing it into Harwich. The amout of salvage awarded (and it was all that could be awarded) was £79, yielding (after payment of the smacks) about 13s. 6d. per day to each man, a sum justly estimated as insufficient either for reward or encouragement.

Considering the removal of drifting wreck a matter of some consequence, I wrote to the Secretary at Lloyd's,

stating the case, and suggesting the advantages which might accrue to that association and to the shipping interest by a pecuniary encouragement to salvors, apart from ordinary salvage, to clear the fairway of such dangerous obstructions to navigation, such reward being made proportionate to the nature and extent of the services rendered to underwriters, on the facts being verified by receivers of wreck, through whom the reward might be paid. But the committee did not consider it expedient to entertain the suggestion, and I have not had a case of the kind since.

Another source of danger and loss I believe to be the carrying of deck cargoes during the winter months, especially of live stock by steamers (even passenger steamers) in the Baltic, home, and coasting trades. How many vessels may have been totally lost from this practice I am not in a position to state, but I will give a slight illustration showing what *might* result.

A beautifully-modelled iron paddle steamer, of 484 tons register, and over 700 tons burthen, licensed to carry 547 passengers, exclusive of the master and thirty hands, in all 577 persons, with the amount of boat accommodation required by the Merchant Shipping Act for about *eighty* of them (supposing it to be all available) —indeed *legally* well found and in good sea-going condition—was very recently crossing from Antwerp with passengers, and, besides a large general cargo, 2,030 sheep and 289 pigs. The 289 pigs and 1,000 of the sheep were carried on deck, 500 more being carried on the bridge. Is it surprising that with a light draft of water (? feet), and so much top hamper, she should labour heavily in a cross sea? It is true that the weather was fine when she started in the afternoon, but the wind freshened, and about midnight, when she was in mid-channel, it came on to blow a strong gale, with a heavy sea. Her commander, a smart and experienced seaman, tried all he could to get her head to wind, but without success, and a more than ordinary heavy sea striking her, she was laid on her beam ends, and in imminent danger of going down. He then, with prompt judgment, and the aid of a few of his crew, succeeded, after much difficulty, in getting about 700 of the sheep overboard, when she slowly righted herself, and lay-to till the gale abated. Had the deck cargo consisted of cattle, instead of sheep and pigs, it is probable that neither the vessel nor those on board would have been ever more heard of.

If those who take an interest in the safety of the seagoing subject would seek for evidence on this point, I think that they might obtain abundance without difficulty.

That some attention was once given to the danger of vessels carrying deck cargoes during the winter months, is evidenced by the 16 and 17 Vic., cap. 107, secs. 170, 171, and 172, which enacts, "That no vessels trading between the North American colonies and the United Kingdom with wood goods shall carry deck cargoes between the months of August and April, under a penalty of £100." The reason for this is given in the 5 and 6 Vic., cap. 17, which recites, "That great loss of life and severe sufferings have been occasioned amongst the crews of ships and vessels, laden with timber and wood goods, from British ports in America, from the practice of having a portion of the cargo stowed on or above deck;" and proceeds to interdict it. The same provisions were perpetuated by the 8 and 9 Vic., cap. 45, repealed by cap. 84, and re-enacted by cap. 93, then embodied in the Act first referred to, and since again repealed by the 25 and 26 Vic., cap. 63, sec. 2.

I now come to my second subject, viz., the necessity for an auxiliary to existing means and appliances for saving life in cases of shipwreck, and a means supposed to be available to that end. That such is sadly wanted, has been abundantly proved in a variety of ways of late years, by the wreck of the *Royal Charter*, the *Orpheus*, the *Stanley*, the *Bombay*, the *William Nelson*, with hundreds of others of different classes, the best remembered, and probably the saddest of all, being the recent loss of the *London*.

A receiver of wreck, in his examinations on oath of the masters of vessels or survivors in cases of casualties at sea, has the horrors of shipwreck in most of its varieties, with the causes which led to them, brought frequently and prominently before him, although in a plain matter of fact way. No man so situated, and possessing the commonest feelings of humanity, could, I think, view such a subject with indifference; and having been an eye-witness as well as an investigator, I have been led to think deeply upon it. What appeared to me —and still appears to me—to be wanted, is a combination of something cheap, strong, portable, plain to the meanest capacity, and at the same time a reliable means of safety, as an auxiliary to boats in all classes of emergency. Several years of anxious study at length led me to a practical result in the shape of my portable life raft, or raft boat.

After having perfected my plan, constructed a model, and submitted them to the severest criticism I could obtain, which I was enabled to do from almost every class of scientific and nautical opinion, finding them to be generally approved, I sent the particulars to the *Shipping and Mercantile Gazette*, of the 11th November, 1864, making the benefits of my invention a *free gift* to the shipping interest, for the purpose of saving life at sea, in the hope that as by that course there would be no restriction in the way of its trial, and (if approved) subsequent adoption, it might be the means of saving many valuable lives. The winter passing, wrecks occurring, and no result being apparent; as the spring of 1865 approached I consulted the then Mayor of Harwich, Mr. Pattrick, with a view to obtaining further opinions and a trial, when that gentleman, with his usual kindly public spirit, called a meeting at the Town-hall, which I attended. The hall was crowded with captains of vessels, salvors, and other practical men, and my model and explanations being unanimously approved, a subscription was raised, a raft built under my superintendence in London, and launched at Harwich in the month of May, when it was tried off Felixtowe by the inspecting commander of Coast Guard, by order of the Admiralty, in regard to one of its uses, viz., as an adjunct to the mortar and rocket apparatus. I was present at the trial, with a number of nautical men of different classes, who pronounced the raft a success. The naval officer also, I believe, made a favourable report to the Admiralty on the subject, but still no result. I then sent a model and particulars to the Dublin Exhibition, where I have been informed it was much commented on and approved, Prince Napoleon amongst others requesting a scale drawing and detailed particulars, with which I furnished him; and on the close of the exhibition I received a medal and diploma, with a very gratifying letter of approval from one of the naval jurors.

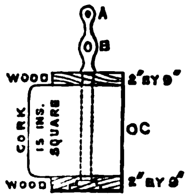
The loss of the *London* attracting public attention, I paid a visit to town with my model, and was gratified to find that the scientific and nautical men to whom I exhibited it were of opinion that the raft might have been of much use even in that desperate case.

The accompanying diagram represents two rafts, each 20 feet long, joined together at their bases, and forming a raft-*boat*. It will be more convenient for illustration, in the first place, to take a half or triangular section, and consider it a raft 20 feet long by 13½ feet base.* It will be observed that in its portable state there are three beams lying parallel; that they are composed chiefly of cork slabs pegged together diagonally 15 inches square; that a planking of Scotch larch, 2 inches thick by 9 inches wide, is placed on the top and bottom of each, flush with the inner side, and bolted through all, so as to form strong and light composite beams with a projection of six inches of cork on the outer side, two of them being 20 feet and the third 12½ft. long; also that the ends are made of solid wood, tongued, so as to form joints

* The scale models and full-sized working raft may be seen at Harwich.

Section of Beam,

Showing its composition, also depth from upper bulwark line to net flooring.



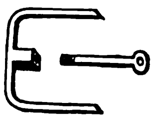
A Rope bulwark.

B Ditto.

C Rope net flooring.

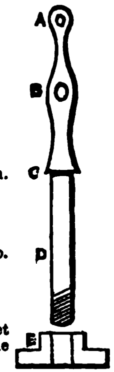
Metal Bands

Containing nuts to receive hollow-headed side-screws sustaining and confining net flooring rods.



Hollow-headed side screw.

Hollow-headed Screw Stanchion.



A Ring for bulwark line.

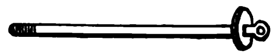
B Ditto.

C Shoulder resting on beam.

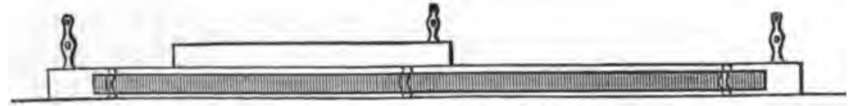
D Screw passing through do.

E Nut to receive screw, let in flush on under side of beam.

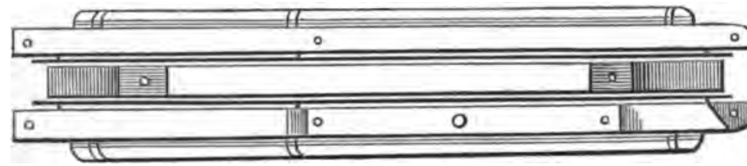
Shouldered Base Screw.



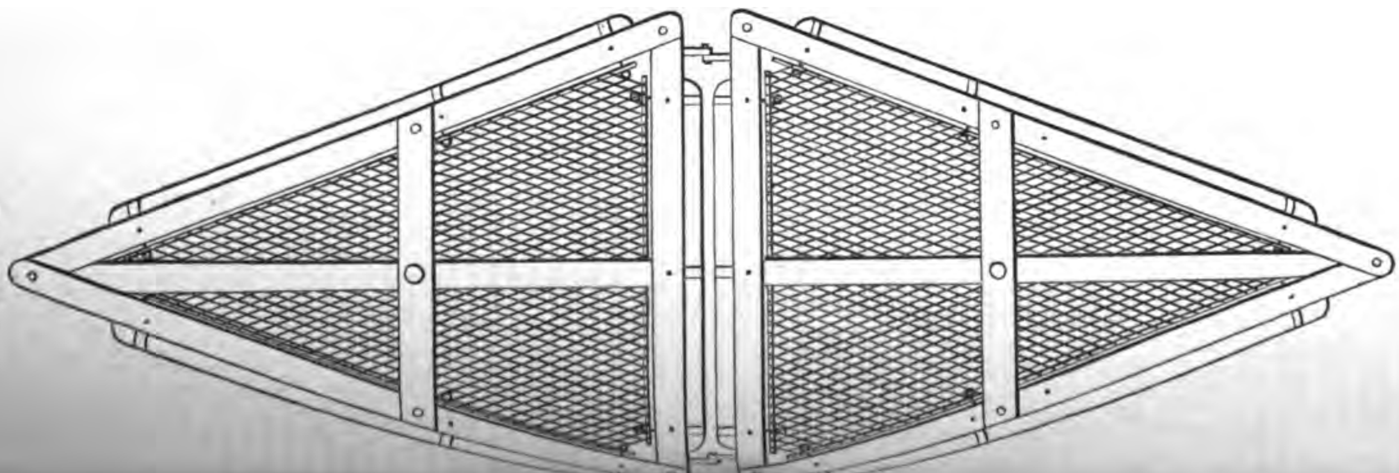
Side View on Deck.



Bird's eye view on Deck.



Metal Rod sustaining Net Flooring.



Raft Boat.

somewhat resembling a mortice and tenon; that a piece of similar planking, without cork, lies under the centre beam (the use of which will be presently seen), and under that again a fold of rope netting rove on iron rods connecting it at the sides, and regulated by hollow-headed screws running through them and the beams, and working in nuts concealed in the iron bands with which they are braced. The short piece of similar planking with a hole in the middle of it, is fastened to the upper side of the right hand main beam in the cross brace, of which more hereafter. It will be seen that the shouldered screw stanchions at each corner, and also those at each end of the cross brace pass through the beams, and resemble man-rope stanchions, with this difference, that they work into screw plates, let in flush with the planking on the under side, and have two equi-distant rope-holes instead of one.

Such is the raft in its portable state, two of which placed on deck, say one on each side of the long boat under her bilge, would occupy very little additional space.

In putting it together you will see that no extraneous aid beyond that of a marline-spike or piece of old iron is required, each part being complete in itself. I first draw together the ends of the two side beams having the longest tongues, and extend the other ends, which spreads the rope netting; take the beam which has been lying in the centre, and place it at the base; run the loose iron rod through the meshes at the base of the rope netting; lay it on the shouldered screws running through the base beam; fit the centre longitudinal plank into the grooves made for it; lift the screw stanchions, draw the corners together, also the loose end of the cross brace from right to left; return the stanchions to their places, and after a few turns of each screw, the raft, in shape an isosceles triangle, and nearly resembling the letter A, is constructed. I then run the double life-line through the holes in the stanchions, by which means an open bulwark is made, and it is ready for launching. The net flooring may be tightened or loosened at will, with the aid of a marline-spike inserted in the hollow-headed screws. Although the details of construction may appear tedious and somewhat complicated on paper, they are practically as simple as possible, and could not well be misunderstood by the most ordinary intelligence.

Supposing the second raft to have been put together at the same time as the first, and the vessel to be in the worst possible condition, lying like a log upon the water, with spars and boats gone, you will see that as they are made flush underneath there will be no difficulty in pushing them overboard, and when overboard that there are several strong and simple means of connecting them at the base of each, by which they may be easily converted into a wave-line two-masted lug-sail raft *boat*, not only fit for sailing, but also capable of being rowed without difficulty, by passing oars through the grummetts pendant from the hollow-headed screw stanchions at each end of the cross braces. You have now, to say the least of it, a skeleton boat, which can neither be capsized nor swamped, a means of making conspicuous a signal of distress, and the power of progression, and the conveyance of about 50 persons, with cask, provisions, and water, either to the shore, or to the fairway of vessels; further, should its flotation be insufficient for the number of persons, it might, in certain cases of emergency, be required to carry, the power of increasing it without difficulty, and in little time, by means of water casks or any spare spars or wood at hand, will, I think, be apparent.

Seeing what was effected by one small boat, and its judicious management, in the case of the *London* is it too much to suppose that many, if not the greater part of the unfortunate crew and passengers who went down with that vessel might have been saved, had she been supplied with a number of such raft-boats, proportionate to her size and average complement of persons on board?

We will next view the matter from the coast—say from a life-boat station. Consider the triangular raft, with a pair of wheels temporarily attached to its sides, as a carriage for the life-boat.—A ship is on the sand, and the life-boat is towed off to her assistance, but the water is found to be so shoal that she would be beached and lost in attempting to get sufficiently near to be of any service. There is the raft, ready to hand; disengage the wheels, launch, and tow it off to windward, as near the wreck as possible, then pay away the rope by which it is secured till it reaches the wreck (for it only draws four inches of water); then those on board can draw it to the lee-side, jump in without fear of injury, and casting off the line let it drift to leeward till picked up in comparatively smooth water. Observe that there is no risk to life in using it as in using a boat; and, however much knocked about, and, possibly, damaged it might become, would not the saving of even *one* life more than equal the *whole* value of a raft costing about £20 or £25?

It has been suggested to me that if such rafts, of convenient size, were kept ready for use on board Light vessels, say at the mouth of the Thames, or any other places where dangerous shoals abound, and too distant from the shore for a life-boat to be available, they would be on the spot ready for salvage smacks or steamers to tow to vessels in distress, and very many lives be saved.

I have official records of evidence taken by myself at different times from life salvors and others, the details of which show this very prominently, but they would lengthen my paper beyond reasonable limits. Suffice it to say, that although Harwich salvors are second to none in humane courage, and annually save many lives in their ordinary smack boats, they are sometimes obliged to look on and see shipwrecked crews almost within speaking distance, drop exhausted one by one from the rigging and perish before their eyes, from the utter impossibility of their reaching them in a boat, through the shoal and broken water on sands like the Shipwash, Longsand and others. Such also was the evidence given by two of them some time ago to a naval officer, who was making enquiry on the subject by order of the Admiralty, with regard to the use of the raft as an adjunct to the mortar or rocket-apparatus. The following account of its trial in that respect, furnished by a gentleman practically acquainted with the subject, who was present on the occasion, is taken from the *Shipping and Mercantile Gazette*, of the 19th May last:—

"Some experiments were tried a few days ago at Harwich with a life raft, the invention of Mr. Wood, the receiver of wreck there. It is in shape like a letter A, and is firmly built of wood and cork combined. The spaces between the strokes of the letter are filled in with a rope netting. The invention, which promises to be of great value to salvors in saving life and property, and to the coast guard in connection with the mortar and rocket apparatus, was presented by Mr. Wood to the public; and the Mayor and Corporation of Harwich have raised a subscription in order to give the invention a trial. The raft was put together and shoved over the pier, and immediately it was in the water righted itself. It was towed away to a spot off the P Tower at Felixstowe, when a line was thrown over the tug-boat from a mortar apparatus on shore, and attached to it a double line, which being passed through a block, the raft was hauled backwards and forwards with ease *by those on shore*, showing its capabilities as a means of saving life from a vessel stranded and going to pieces on a lee shore. As many as 14 men got on board her at one time, and were landed across a strong tide. Experiments were then made with a view of ascertaining whether it was likely to capsize, and although 10 men got in one corner of it, they were unable to send it under or turn it over. On the whole, the experiments were highly successful. Capt. Jackson, R.N., of the coast

guard, will make an official report to the Admiralty on the subject."

Now, is it not probable that as a means of bringing a whole crew on shore at once it would, in many cases, be preferable to the breeches buoy, which can only bring one at a time, and with these additional advantages, that women and partially disabled men could avail themselves of it, and that, requiring no elevation as the breeches buoy does, there would be no necessity, in the case of a vessel being dismasted, to draw the people through the water at the risk of drowning them, as I fear does sometimes happen? That there was not the slightest difficulty in working it was proved at the trial; and if the Admiralty thought fit, such rafts might be kept at the various coast guard stations, where they might be the most likely to be of service, with much advantage, and at little cost, while at the same time they would not interfere with the use of the breeches buoy where its use appeared to be preferable.

As I wish this to be a simple, practical paper, I will now leave to consideration and discussion the merits of what I have brought forward, and should they lead to a trial of the means I have exhibited, and an increase of safety to life and property be the result, I shall feel that the anxious labour and expense I have incurred have not been incurred in vain.

In the very able paper recently read at the Society of Arts by Mr. Gray,* of the Board of Trade, the inadequacy of modern legislation as regards our merchant shipping to meet the ends sought to be attained was, I think, very forcibly demonstrated; but without venturing to offer an opinion as to whether an increase or a decrease in governmental interference would be the more beneficial to the public, I have endeavoured to show that in furtherance of the subjects under consideration there is much which might be easily and beneficially carried out, and that at a comparatively trifling cost of labour and money.

Many other uses for the use of the life raft or raft boat have been suggested to me, but as they are foreign to the subject of this paper, I will only briefly allude to one, as applicable to the signs of the times, viz., that they might be found useful as a means of landing troops, and even conveying a gun *inside* an enemy's range in shoal water, without the slightest chance of being sunk by shot.

LAW OF COPYRIGHT IN FRANCE.

The discussion in the Corps Legislatif of the bill for altering the law respecting the rights of authors, and of their heirs and representatives, has excited great interest, and the opinions expressed in the debate and the vote of the chamber have caused the Government to make an alteration in the original plan.

Under the laws lately in force every author possessed, during his whole life, the exclusive right of authorizing publication of his works by means of the press, on the stage, by engraving, or otherwise; if the author died leaving a widow married under what is called the régime of community, that is to say, the property of both man and wife being in common, the widow enjoyed the same privilege during her lifetime as regarded all works published by her husband during the marriage; if there were no widow, the rights passed to the descendants of the author for thirty years from his death; lastly, if he left no descendants but only parents, collateral relations, other representatives or legatees, the rights went to them only for ten years after the death of the author.

The new law, as proposed by the Government, extended the enjoyment of the rights to all heirs or representatives, whether direct or otherwise, to the term of thirty years after the death of the author, or that of his widow. It was also provided that those heirs or other representatives whose rights should be existing under the old law when the new one was promulgated, should have the benefit of the alteration. This clause excited special interest, from the fact that the representatives of two of the most remarkable poets that France has produced, namely, Alfred de Musset and Alfred de Vigny, whose rights are now nearly expired, would, by the proposed law, have had them extended for twenty years.

The commission, of which M. Jules Simon was president, was divided in opinion, five out of the nine members of which it was composed being of opinion that intellectual property should be perpetual, like freehold; these five members, however, differed in matters of detail, and therefore a compromise was effected by which the term of thirty years mentioned above was increased to fifty.

In the chamber several points were raised and discussed with great warmth, but they principally related to the position of man and wife under the various régimes of marriage, and therefore have little interest out of France.

The result of the first discussion was to cause the commission to reconsider the clauses of the bill, which was afterwards carried, as regards its principal items. According to the new law, then, the rights of all heirs and representatives whatsoever are prolonged to fifty years from the death of the author. During these fifty years the widow or widower of the author, whatever may be the régime or conditions of the marriage, has a life-interest in such property, provided the author shall not have disposed of it during his lifetime or by will. The right of the widow or widower is annulled either by separation having been pronounced against the survivor, or by re-marriage.

The Corps Legislatif refused to sanction the clause which would have made the act retrospective, and consequently the rights of all heirs and representatives of authors who were dead previously to the passing of this new act remain untouched.

INTERNAL NAVIGATION IN FRANCE.

Recent official statistics give the following information respecting the internal navigation of France. The total length of the navigable rivers of the empire is stated to be 7,000 kilometres, or 4,376 miles English, this total including the embouchures or maritime portions of rivers, to the extent of 260 kilomètres. Since the year 1835, the improvement of the fluvial navigation has been pursued with great zeal and success. Shallow rivers have been provided with weirs and sluices, and in others improved channels have been formed by means of sunken dams, which concentrate the water in a single way. All the great rivers of France have been more or less improved by these methods and by dredging, and the outlay for these purposes, since the year above mentioned, has reached to more than eight and a half millions sterling. Other important works are now in hand; the banks of the Marne and of the Upper Seine, between Montereau and the mouth of the Burgundy canal, are being straitened, and their beds deepened, so as to canalize these rivers in those parts; the Lower Seine, between Paris and La Briche, will soon be greatly improved by the construction of a weir and sluices at Suresnes, by the Bois de Boulogne; dams, which have greatly improved the Rhone, are now being continued in that portion of the river which lies between Lyons and Arles; a marine canal is being formed at St. Louis, to supply a navigable way, always accessible, in place of the tortuous and often impossible navigation by the mouths of the Rhone itself; on the Saone are being constructed five weirs, with sluice-gates, one at the Ile Barbe, and four between Chalons-sur-Saone and Lyons; this river is the high-water way between these two points, and an immense quantity of wine, charcoal, and wood are conveyed by it, but it is full of islands, shallows, and cross-currents, and is most inconvenient in every respect; works are also progressing on the Sarte, the Mayenne, the Lot, the Vire, the Var, and other rivers. The navigable canals of France have a total length of

* See present Vol. of *Journal*, p. 239.

4,800 kilomètres, or 3,000 English miles; of these more than one-fifth are in the hands of companies or individual proprietors; the rest are maintained and worked by the state. About a hundred miles of canal are now in hand; the Canal de Vitry at Saint Dizier; the colliery canals of the Sarre, of Roubaix, from La Rochelle to Marans, and that of the Upper Seine, between Troyes and Bar-sur-Seine. In addition to these important works, the canals of the Upper Deule, the Canal du Centre, those of Britanny and of the Somme, that which connects the Rhone and the Rhine, and that of Burgundy, are all being improved, or about to be taken in hand. The internal navigation of France has for a long time been below the wants of the country; and now that the coal, iron, and other great industries are being rapidly developed, the improvement of the rivers and canals is an immense national benefit, the cost of which is trifling, as compared with the benefits which it must confer on the trade and commerce of the empire.

Fine Arts.

History of the Fine Arts, by Cardinal Fesch.—It is said that amongst the papers of Joseph Bonaparte, formerly King of Spain, and left by the late Prince Musignano, are some highly important manuscripts of Cardinal Fesch, including a History of the Beaux Arts. The Cardinal was a great admirer of works of art, and a liberal patron of artists, and his own collection of pictures and sculptures was worth nearly a million and a half sterling.

Discovery of Old Mural Paintings.—An interesting discovery has been made at Nancy, while demolishing an old chapel erected by Henry de Ville, Bishop of Toul, between the buttresses of the Cathedral. These paintings had been covered for many years by a coat of paint, but they are described as exhibiting remarkable finish in execution and brilliancy of colour; they are supposed to be by an Italian master of the fifteenth century, and the name of Fra Angelico de Fiesole is suggested as that of the artist. The chapel in which the paintings are is being demolished, in order to disengage the body of the cathedral from extraneous buildings, and an attempt will be made to transfer the pictures to canvas, for the museum of the town of Nancy.

Anniversary of Nicolas Poussin.—The birth-day of this famous painter was celebrated with great *éclat* on Friday, the 15th of June, at Andelys, where he was born, the expenses of the *fête* being defrayed by public subscription.

Art Exhibitions Abroad.—Summer visitors to the Continent have now excellent opportunities of judging of the taste for art which exists in all quarters. The exhibition established by the Society of the Friends of Art at Amiens is announced to open on the 14th of July and to remain open until the end of August. The fifteenth exhibition of the society bearing the same name at Boulogne opens on the 20th July, to close on the 15th of September. The annual exhibition at Grenoble will be held between the 15th of July and the 20th of August. This exhibition is managed by a local Art Society, which expends a considerable amount annually in the purchase of pictures, and the municipal authorities subscribe a sum equal to £240 towards the expenses; in addition to this the latter have announced that they will, this year, devote from four to five hundred pounds to the purchase of a picture, or pictures, at the exhibition, if any appear there which are thought worthy of a place in the museum of the town, which contains already a rich collection. An exhibition is now open at Orleans, to close on the 10th of July. The annual exhibition of the Academy of the Fine Arts at the Hague opened on the 4th of June, and was announced to remain open until the 4th of July. The triennial Exhibition of Fine Arts of Brussels, a highly important one, opens on the 1st of August and closes at the end of September. Lastly, the seventh exhibition of works of Art has just opened its doors at Spa, and will last for two months. Such are a few of the means, increasing every year, by which the love of art and the interests of artists are cultivated abroad. The Paris Salon closed on the 20th June, but visitors will find in the same building, the Palais de l'Industrie in the Champs Elysées, a noble collection of the pictures of the old schools—Italian, Flemish, and French—lent by amateurs, principally ladies, for a charitable purpose. This exhibition, which has been open for some time, and is to remain so to the end of July, has just been enriched by a contribution of twelve works by the Empress, namely, four by Wouvermans, two by J. B. Pater, one each by Berghem, Van de Velde, Wynants, Adrien Van Ostade, and Greuze, and a portrait in pastel of Louis XVII., by Madame Lebrun. In short, the exhibition in question is a collection of some three hundred gems, all of which belong to private cabinets, and have therefore the additional attraction of being new to the great majority of the public.

Manufactures.

Lucifer Matches.—It appears that M. Gaillard has lately presented to the Academy of Sciences what he calls a new process of manufacturing common phosphorus matches. The method consists in reversing the ordinary mode of preparation. Instead of steeping the wooden slips first into sulphur and then into phosphorus, he plunges the matches into the phosphorus in the first place, and afterwards into the sulphur. This process is attended with several advantages. One of these is that sulphur is insoluble in water, and that, not being fusible under a temperature of about 128 Fahrenheit, there is no risk of accidental or intentional poisonings of food by these matches, since the sulphur forms an insoluble covering for the phosphorus. Another advantage depends on the hardness of the sulphur coating, which requires more friction than is ordinarily applied for its removal, and the laying bare of a portion of the phosphorus. This is calculated to decrease the risk of fires occurring accidentally from the too-ready inflammability of phosphorus as an outer covering for the lucifer match. How far this process is really new will be seen from the following extract from the "Transactions" of the Society of Arts, referring to a meeting held on May 21, 1846:—"The thanks of the Society were voted to Mr. C. M. Barker, for his improved congreve-match. Mr. Barker's improvement consists in putting a layer of sulphur over the combustible composition, instead of (as formerly) putting the composition on over the sulphur; so that it requires a temperature of nearly 300° to ignite the match by heat, and a greater quantity of friction than with those formerly used. Moreover, the match is not affected by damp."

Defective Safety Valves.—In a recent report to the Manchester Association for the Prevention of Boiler Explosions, Mr. Fletcher, the engineer, in speaking of a fatal explosion which occurred to a small boiler employed for winding at a colliery pit, after calling attention to the imperfection of the man-hole, which he regards as one cause of the explosion, goes on to say:—"The omission of the manhole mouthpiece was not the only defect in the equipment of this boiler, since it was fitted with but a single safety-valve, and that of the most dangerous construction. This safety-valve, which was an inch and one-eighth in diameter, was loaded with a spiral spring of so stubborn a character that it was found, on carefully testing it with hydraulic pressure after the explosion, that one turn of the nuts which held it down in its position was sufficient to raise the pressure from 80 lbs. to 150 lbs, while a second turn raised it from 150 lbs. to upwards of 200 lbs., so that there was but a turn of the nut be-

tween safety and explosion, or a single thread between life and death. So stubborn a spring as this would never admit of a free escape, and though the steam might just wheeze at the stated blowing-off point of 80 lbs., yet the pressure would rapidly rise on blowing-off freely. Added to this, the mode of securing the spring was most objectionable. It was held down in its position by a couple of ordinary nuts, operating on a cross-head carried by a couple of pillar bolts, on to which the nuts were screwed; but there were no collars on these bolts, neither were there any ferules slipped over them to prevent the nuts being over screwed, and thus the pressure being increased either by accident or design, although, as just shown, the precise position of the nuts was of so much importance. It would frequently be the engine-man's duty to take out the safety-valve to clean it and grind it up, and in order to do this the nuts securing the spiral spring would have to be taken off, when it would be a matter quite of haphazard in replacing them, whether, with so stubborn a spring as this was, the valve was screwed down to a pressure of 100 lbs. or 200 lbs. The arrangement was altogether a most dangerous pitfall, and the valve quite unfit to be used at all, but more especially to be the only one upon a portable boiler, which is, as a rule, worked by men of but average ability, and who, though they may be careful, are not mechanics."

Commerce.

Coffee and the War.—Speaking of the influence of the present war upon the price of this commodity, Messrs. Travers say:—"Recent events have affected the value of coffee considerably, and there is a marked contrast between the present position of the market and what might reasonably have been anticipated three months ago. At that time the deliveries on the Continent of Europe, as well as in the United States, were proceeding satisfactorily; and although, on the other hand, crops had been large, and cultivation was being rapidly extended, it seemed that production and consumption were advancing in almost an even ratio, and that, at the worst, a ready market and a remunerative price could always be depended upon for all the finer kinds. The war in Germany has, however, partially closed the principal market, and a very severe decline in the prices of most kinds, notably in those of the finest descriptions of Ceylon, has immediately resulted —a decline which is not likely to be fully recovered for some time to come, as, whatever may be the duration of the war, it is sure to involve a large amount of privation and misery, sufficient, perhaps, to curtail consumption for several years after the restoration of peace. Nor is there any prospect of this falling off being balanced by a larger consumption in any other part of the Continent; on the contrary, appearances point rather in the opposite direction, and it seems as if England were the only country in Europe in which any improvement could be looked for. Even here much cannot be expected, especially now that the reduction of the duty on tea has caused so large an increase in the home consumption of that article, but an abundant supply of fine coffee, at moderate prices, will undoubtedly go far towards restoring it to its old place in public favour, and a reduction of duty, if it could be made—and surely no time is so seasonable as when the stock is heavy and likely to increase—would probably do so still more; while, if to moderate prices and a lower duty could be added any approximation to the skill in the preparation of coffee possessed by continental nations, a large additional quantity would doubtless be consumed in this country. Results such as these are not always obtained at once, and are at the best doubtful, and therefore for the present the only compensation for the depressed state of the European coffee market is to be sought in the United States of America. Here there is a considerable stock, but the deliveries are progressing satisfactorily, and will probably continue to do so; America may therefore make heavy calls from time to time on the producing countries, but she will not supply the place of Germany as a market for the finer kinds, and should the crops turn out to be so large as is at present anticipated, prices must range lower than they did last year."

French Tea Duties.—Some alteration in the Customs' duties on tea imported into France have been recently made, the effects of which (say Messrs. Travers) may not improbably exercise before long a considerable influence on the prospects of the tea-market in England. By an Imperial decree dated May 30th, it is enacted that the tariff for the importation of tea shall henceforth be as follows:—40 francs per 100 kilogrammes of tea, if brought over from tea growing countries in French bottoms, and 100 francs per 100 kilogrammes, if imported from other countries and in foreign vessels, the usual port dues being included in this tariff. Taking the franc at 10d. and a single kilogramme at 2¼ lbs., which is quite near enough for all practical purposes (100 kilogrammes being exactly equal to 220·48lbs. avoirdupois), we find that the duty on tea imported in French bottoms will be $1\frac{9}{11}$ or nearly 2d. per lb., whilst that on tea in foreign vessels and from countries which do not grow tea, will be rather less than 5d. per pound (the exact sum being $4\frac{6}{11}$d.). Hitherto the consumption of tea in France has been inconsiderable, partly owing to the apparently national predilection for the more stimulating beverage, coffee; partly, too, no doubt, to the high rate of duty imposed, which acted practically as a direct prohibition to its use. Referring to Mr. Newdegate's valuable work on the *Customs Duties of all Nations*, we find that the following scale was in force for tea imported in French bottoms; 6½d. per lb., if it came from India, 11d. per lb., if from the Black Sea, and a few other places, with the approval or countenance of the French consul, and as much as 1s. 9¾d. if it came from any other country. One uniform duty of 2s. 2d. was levied on all teas imported in any vessels, other than French, no matter from what quarter of the world they came. The tendency of the recent alteration, whilst it may to some extent afford an opening for British commerce, is clearly to throw the trade as much as possible into the hands of the French, by giving them such a bounty as a reduction of two-thirds of the duty paid by foreign vessels. The favourable position which the French merchants will thus acquire as importers, will be precisely similar to the condition of our English merchants in the time of the Commonwealth, when enriched by the protective duties of our Navigation laws. Such laws are at the present day quite out of date.

The Coal Supply.—In the *Gazette* of the 2nd July it is notified that the Queen has been pleased to appoint the Duke of Argyll, K.T.; Sir Roderick Impey Murchison, Bart., K.C.B.; Sir William George Armstrong, Knt., C.B.; Henry Hussey Vivian, Esq.; George Thomas Clark, Esq.; Joseph Dickinson, Esq.; George Elliot, Esq.; Thomas Emerson Forster, Esq.; John Geddes, Esq.; Robert Hunt, Esq.; John Beete Jukes, Esq.; John Hartley, Esq.; John Percy, Esq., M.D.; Joseph Prestwich, Esq.; Andrew Crombie Ramsay, Esq.; and John Thomas Woodhouse, Esq., to be her Majesty's commissioners to investigate the probable quantity of coal contained in the coal-fields of the United Kingdom, and to report on the quantity of such coal which may be reasonably expected to be available for use; whether it is probable that coal exists, at workable depths, under the permian, new red sandstone, and other superincumbent strata; to inquire as to the quantity of coal at present consumed in the various branches of manufacture, for steam navigation, and for domestic purposes, as well as the quantity exported; and how far, and to what extent, such consumption and export may be expected to increase; and whether there is reason to believe that coal

is wasted, either by bad working or by carelessness or neglect of proper appliances for its economical consumption.

Colonies.

Kerosene Oil in New South Wales.—A Sydney paper says that energetic steps are being taken to develop this branch of commercial enterprise in this colony, and every step in advance only tends to confirm the great value of its oil-bearing minerals. It could scarcely be expected that in a colony like this, where few could have been acquainted with what is comparatively a new manufacture—the process of kerosene oil production not being many years old—the necessary works could be completed without the delay which prudent inquiry would necessitate. Whatever inducements there might be for prompt action in putting these mineral treasures into a marketable shape, no very large amount of the shales of Hartley, Wollongong, and Stoney Creek have yet been submitted for distillation, but the Australasian Mineral Oil Company have operated upon a considerable quantity of cannel from the Hunter district. The shales are well known to yield an oil of an excellent quality, though small in quantity, but this inferiority is to some extent qualified by the valuable coke that is left from the cannel, the shale leaving only a pale coloured ash. This company have constructed near Sydney extensive works replete with the appliances for an immense production. They have had the services of an engineer, who, added to his qualifications for superintendence in construction where so much machinery is required, has the not less important acquaintance with the *modus operandi* adopted in the largest and most successful oil-producing establishments in the United States.

The Paris Exhibition of 1867 and New South Wales.—The Commissioners appointed by the Government to carry out the necessary arrangements for the adequate representation of the arts, manufactures, and natural products of this colony, at the Paris Exhibition, have made a variety of appointments with a view to assist them in performing the duties entrusted to them. The offer by the Government, of Executive Commissioner, has been accepted by the Hon T. A. Murray, President of the Legislative Council, and a letter has been forwarded to the Secretary of the Science and Art Department, London, communicating this appointment, and stating that this colony would fully occupy the space allotted to it (namely, 1,000 feet), in the Exhibition. Five sub-committees have been formed—the first, to deal with matters of finance; the second to collect mineral specimens; the third to collect specimens of the vegetable products of the colony; the fourth to collect specimens of animal products; and the fifth to collect specimens of the arts and manufactures of the colony. A circular has been addressed to the several benches of magistrates, gold commissioners, public institutions, public companies, and persons residing in various parts of the colony, who, from their positions and occupations, are likely to aid in obtaining contributions, requesting their co-operation; and this circular is accompanied by a list of classified articles, specimens of which the Commissioners are desirous of obtaining.

Wool Production in New South Wales.—It appears by a colonial journal that in a Parliamentary investigation, recently instituted to inquire into the condition of this colony, it was distinctly proved that the wool-producing powers of the land would be greatly increased if the runs were fenced in. Both the quality and the quantity of the wool would be improved. Fencing would thus repay its cost, and return a considerable profit on the investment. Many of the large squatters are said to be willing and anxious thus to invest capital in a way which, while it will increase their own profits, will improve the country and add to its wealth, but they appear to be debarred by the fact that the leases at present granted are too short to justify the sinking of capital in such improvements as fencing.

Obituary.

Mr. R. Garrett, the eminent agricultural implement manufacturer, died on the 26th June, in his 60th year. While Mr. Garrett was yet a young man—in the spring of 1836—the business of his father at Leiston, Suffolk, to which place his grandfather had gone as a sickle maker and blacksmith in 1778, was relinquished in his favour. At that time about 60 men and eight or ten horses were employed, but no steam power had yet been called into play at the works. The once small village has now become a town of more than 2,000 inhabitants, all dependent on the Leiston works. The 60 workpeople have increased to 600, the horse power has given place to steam power, and the name of Garrett has become known throughout Europe, in Egypt, Australia, and almost all over the world. The house of Garrett figured with honour also at the International Exhibitions of London, Dublin, Paris, Hamburg, Vienna, and Madrid, where it won no fewer than 60 gold medals and 60 silver ones, together with £1,200 in cash, and an immense number of honourable mentions. When the East Suffolk Railway, now merged in the Great Eastern system, was brought forward, Mr. Garrett found capital to the amount of £10,000. When the Albert Memorial College at Framlingham was suggested, Mr. Garrett came forward with a donation of £500. He was elected a member of the Society of Arts in 1848.

Notes.

Submarine Road to the Continent.—Mr. Hawkshaw, the well-known engineer, is engaged in the preliminary operations necessary to determining the practicability of a submarine road to the Continent. Borings are now being made at a considerable expense in the neighbourhood of Dover, and, by permission of the French Government, between Calais and Boulogne; and in the course of this summer explorations will be made in mid-channel. Some trials are essential, in order to obtain positive knowledge concerning the nature, extent, and thickness of the strata. It is proposed to carry on the excavations for the tunnel from both ends, as well as from shafts in the channel. At the top of the shafts powerful steam-engines will be erected for pumping, for drawing up the excavated material, and for supplying power to the machinery by which excavation will be effected. The tunnel will communicate on the French side with the Northern of France Railway, and on the English side with the South-Eastern and London, Chatham, and Dover Railways, "so that there will be an unbroken line of railway communication between London and Paris."

The Last of the Cotton Famine.—A report has been presented to Mr. Villiers, the president of the Poor-law Board, by Mr. Rawlinson, C.B., from which it appears that the Public Works Office in Manchester will be broken up this year, and that Mr. Arthur Arnold, the resident Government inspector, will leave the district. The report shows that the amount of money advanced under the public works (Manufacturing Districts) Acts, 1863-4 has been £1,343,806. Up to the 31st of March last £1,177,701 4s. 10¾d. had been expended. The entire length of sewerage and drainage works executed at the same date was about 560,161 lineal yards, or about 318 miles; and the total area of paving and other surface work of street and highway improvement then completed was 2,131,167 superficial yards, or about 440 acres.

Bench Marks in France.—The *Builder* says:—A most important work is now in progress throughout

France, viz., the levelling and establishing of bench-marks all over the country. The object of this undertaking is to furnish a series of levels that will enable the course of canals, railways, &c., systems of drainage and irrigation, and other public and private works, to be laid down on the map and marked out on the ground without any error. The operations were commenced in 1857, under the control of the Minister of Public Works, and will be terminated in five or six years hence; the work has been, since the beginning, under the superintendence of M. Bourdalone, civil engineer, to whom is due the series of levels taken for the Isthmus of Suez from the Mediterranean to the Red Sea. The datum line of the levels in France is the usual sea-level; the bench-marks established on the ground consist of cones of cast-iron, set in masonry, on the spot where the levels are required to be noted; and a great number of these have been placed in lines of level which touch seaport towns, groups of rivers and canals, lines of railway, roads, &c. More than 18,000 linear miles have been thus laid down as base lines; but, in order to complete the work, the operations must be extended to 120,000 miles. This gigantic undertaking is very costly; but, when once completed, it will enable every engineer or contractor, who may wish to attach a series of levels in any part of France with those of the remotest districts, to do this by aid of a bench-mark on the spot, or near at hand, for the maximum space between the levels is to be only three-quarters of a mile. The accuracy of these levels is such that they are true to three centimètres, or 1·2 inch for the whole length throughout France.

British Association for the Advancement of Science.—At the forthcoming meeting of the association in Nottingham, the opening address will be delivered in the new theatre by Mr. W. R. Grove, Q.C., F.R.S., the president elect. Excursions of scientific interest will be taken to the Midland Railway works at Derby, Eastwood Riddings, Cinderhill, Annesley (the birthplace of Lord Byron's "Mary"), Newstead Abbey, the Derwent and the Wye Valleys and Charnwood Forest. The Dukes of Devonshire and Rutland, Mr. W. F. Webb, Mr. Ambrose de Lisle and other gentlemen have volunteered to entertain the members of the association at the above places.

MEETINGS FOR THE ENSUING WEEK.

Mon. ......R. United Service Institution, 8½. 1. Commander P. H. Colomb, R.N., "Ships Lights at Sea." 2. Capt. Charles H. Curme, R.N., "A few remarks on the Rule of the Road, and suggestions for its amendment."

Tues. ...Ethnological, 8. 1. Mr. T. White Baker, "On the Tribes of the Nile Basin." 2. Mr. Gilbert Malcolm Sproat, "On the West Coast Indians in Vancouver Island." 3. Lt.-Col. A. Fytche, "On the Aborigines of the Andaman Islands."

Wed. ...R. Literary Fund, 3.

Sat ......R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 27th June, 1866.*

British Columbia and Vancouver Island—Further Despatch.
United States—Correspondence respecting the termination of the Reciprocity Treaty.

Session 1865.

442. (D.) Poor Rates and Pauperism—Return (D).

Delivered on 28th June, 1866.

198. Bills—Local Government Supplemental (No. 2) (as amended by Select Committee).
199. " Charitable Trusts Deeds Enrolment.
63. (vii.) Committee of Selection—Eighth Report.
272. East India (Finance and Revenue Accounts)—Parts I. and II.
363. Account Books (Public Departments)—Treasury Minute.
368. Roman Catholic Prisoners (Middlesex)—Correspondence.

Delivered on 29th June, 1866.

216. Loan Societies—Abstract of Accounts.
Persia—Convention.
Commerce, Navigation, Reciprocity, &c.—Return of Treaties.

Delivered on 30th June, 1866.

68. (v.) Trade and Navigation Accounts (31st May, 1866).
339. Cunard, &c., Steamers—Return.
367. Corrupt Practices at Elections—Returns.

Delivered on 2nd July, 1866.

362. Strand Union Workhouse—Report by R. B. Cane.
376. Cattle Diseases Prevention Act (1866)—Memorials.

Patents.

From Commissioners of Patents' Journal, June 29th.

Grants of Provisional Protection.

Artificial teeth, making—1546—M. C. Rogers.
Bakers' ovens, heating—1608—J. Lunt.
Boots, attaching soles and heels to—1490—C. Lock.
Brushes—1592—A. Parkes.
Buckles—1602—J. Holloway.
Carding engines—1606—E. H. Waldenstrom and T. Wrigley.
Cards—1582—H. J. Griswold.
Coffins—1612—J. C. Cole.
Corks and bungs, cutting—1549—C. McFarland.
Drilling machines—1574—W. E. Newton.
Dyeing—1537—A. Paraf.
Feed suction, valves for regulating—1584—J. J. Ingram & G. R. Phillips.
Fibrous materials for spinning, &c., preparing—1527—G. T. Bousfield.
Fuel, combustion of—956—F. Wise.
Galvanic batteries—947—C. F. Carlier.
Hats, &c.—1572—J. J. Friedmann.
Ice, breaking—1416—J. Purcell.
Journal boxes, composition for—1578—W. E. Newton.
Kamptulicon—1564—A. Parkes.
Keys, &c.—1515—E. T. Bellhouse and W. J. Dorning.
Metals from their ores, separating—1250—P. Spence.
Railways—1526—W. E. Newton.
Safes—1570—A. Grivel, jun.
Sound boards—1476—G. Green.
Spinning frames—1588—D. Cochrane.
Steam boilers—1576—W. J. Fraser.
Steam boilers, heating the feed water of—1589—A. Thornton.
Steam generators—1408—W. A. Lyttle.
Steel—1207—A. V. Newton.
Thread, finishing—1533—H. and J. Crawford.
Waggons or carts—1604—F. Cambridge.

Invention with Complete Specification Filed.

Surfaces, printing—1683—T. S. Hudson.

Patents Sealed.

22. W. Buckley.	172. W. Sumner.
24. G. S. Robertson.	239. J. W. Swan.
25. B. Blackburn.	262. A. S. Brossman.
57. J. Hodges.	639. E. W. Otway.
72. H. Hutchinson.	908. J. Parkes, jun., & J. Parkes.
73. A. Leighton.	1277. G. T. Bousfield.
135. H. E. Newton.	

From Commissioners of Patents' Journal, July 3rd.

Patents Sealed.

39. J. Ronald.	94. C. Bartholomew.
42. E. Walker.	120. H. F. Smith.
43. H. D. P. Cunningham.	122. C. G. Johnson.
44. W. Winter.	189. W. E. Gedge.
49. W. G. Beattie.	209. G. B. Woodruff.
54. T. W. Roys.	240. T. Spencer.
55. J. Kerridge & W. Peverett.	315. E. Candler.
56. A. Gibb.	334. J. H. Johnson.
60 F. Wise.	356. T. Spencer.
67. J. M. Macrum.	483. A. H. Hassall.
87. C. O. Papengouth.	502. J. H. Whitehead.
88. J. W. Gray.	

Patents on which the Stamp Duty of £50 has been Paid.

1604. H. G. Craig.	1712. F. G. B. Westmacott.
1788. A. Montleart and W. Tent.	1633. J. Blake.
1619. G. Davies.	1639. J. H. Johnson.
1647. A. A. Croll.	1644. J. and J. Cole, jun.
1710. P. G. B. Westmacott.	

Patents on which the Stamp Duty of £100 has been Paid.

1546. T. Wight.	1557. E. A. Brooman.
1559. T. Bell.	1562. J. A. Wilkinson.

Registered Designs.

An Improved Oval Brush—June 19—4796—H. Reed, Birmingham.
A Filter for Filtering Wine—June 29—4797—Farrow and Jackson, Great Tower-street, City.
Design for the Internal Fitting of Boxes or Cases for holding Bottles or other like Articles—July 3—4798—F. J. Campbell, 17, Lower Thames-street, City.

Journal of the Society of Arts.

FRIDAY, JULY 13, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for next year is in preparation, and will shortly be ready for issue.

Proceedings of the Society.

Musical Education Committee.

The Committee met on the 27th ult., Henry Cole, Esq., C.B., in the chair. The Committee agreed to the following as their

First Report.

1. The Committee appointed to consider and report on the state of the Musical Education of the United Kingdom submit the evidence* they have taken, and have agreed to the following as their first Report.

2. The Committee have obtained full information of the constitution, present state, and working of the Royal Academy of Music; and have obtained evidence on the National College of Music, the London Academy of Music, and the London Vocal Academy. They have received a report on the Military School of Music, Kneller Hall. On the subject of Church Music the Committee have been in correspondence with the Deans and Chapters of the several Cathedral Churches. Through the Secretary of State for Foreign Affairs reports have been obtained of the regulations of the several Academies at—

Paris,	Leipsig,
Munich,	Milan,
Vienna,	Naples,
Prague,	Berlin.

The documents relating to these several Institutions are printed in the appendix.

The Secretary of the Society of Arts was despatched to Brussels and Liège in order to report on the Musical Institutions there. His report will be found in the printed evidence.

3. In respect of the Royal Academy of Music, Sir George Clerk, Bart., Chairman of the Committee of Management, and Mr. Lucas, Principal of the Academy, have given complete evidence.

The views of the musical profession have been stated by the following gentlemen, who have kindly responded to the invitation of the Committee, and have either appeared personally before the Committee or favoured them with written observations:—

Professor Sterndale Bennett.	Mr. C. Lucas.
Mr. Benedict.	Mr. G. A. Macfarren.
Mr. Costa.	Sir F. Gore Ouseley.
M. Garcia.	Mr. Ernst Pauer.
Mr. A. F. Godfrey.	Mr. Otto Goldschmidt.
Mr. J. Hullah.	Mr. Turle.
Mr. Henry Leslie.	Dr. Wylde.

The Committee have also to acknowledge the valuable evidence and suggestions which they received from

The Right Hon. Sir George Clerk, also

Messrs. Capes,
Harry Chester,
H. F. Chorley,
Cole, C.B.,
P. Le Neve Foster, and
B. St. John B. Joule.

4. The wide cultivation and use of music in this country from the earliest period render it superfluous for the Committee to dwell on the importance and value of this ancient branch of the Fine Arts. The Committee have not considered it within their province to enter upon the subject of the various systems of teaching music. Their inquiries have rather been directed to ascertaining the principles and the nature of the administration by which the general musical education of the people of this country may be systematically conducted on a scale and with results at least equal to those of the Academies which flourish on the Continent of Europe.

5. To the Royal Academy of Music, which is established under a Royal Charter, and at present receives a small annual vote from Parliament, the Committee naturally turned their attention, as being the institution best calculated to serve as the basis for any enlarged National Institution for promoting musical education; and the Committee had the satisfaction of finding the utmost willingness on the part of the Royal Academy to adopt whatever course might be necessary to improve its organization and render it thoroughly efficient.

6. Looking to the past history of the Royal Academy of Music and to the support which foreign Musical Academies receive from their respective governments, the Committee consider that adequate Parliamentary funds, with ministerial responsibility for their expenditure, are essential to the establishment and maintenance of a National Academy of Music worthy of its object.

7. The Committee consider that a National Academy should afford gratuitous education to a limited number of persons having great musical gifts, who, after proper training at the public expense, would engage to devote their talents to the service of the public as professors of the art of music, and that the form in which Parliamentary assistance could be best afforded would be by scholarships, which should be held by candidates who, in open competition, had proved that they are endowed with the gift of musical ability.

8. The Committee are also of opinion that besides the training of Free Scholars, the Academy should be open to the public at large on the payment of adequate fees, which might be graduated according to the musical ability of the pupils and be auxiliary to the support of the Institution.

9. As soon as the Institution shall have obtained public confidence, it may be hoped that the Cathedrals and various other corporations will provide the means of sending from their respective localities to the Academy young persons of musical genius; and the Committee recommend that the Society of Arts should itself set the example of such endowments by establishing a limited number of scholarships.

10. The Committee consider that, before Parliament can be asked to increase its present vote to the Royal Academy of Music, the Academy should provide, through the voluntary aid of the public, permanent and suitable premises, possessing all requisite facilities for practice and study.

11. The Committee find that in 1854 the Royal Academy made an application to H.M. Commissioners for the Exhibition of 1851 for a site on the Kensington Gore Estate, and also for pecuniary assistance towards erecting a building, but that, although a Committee, presided over by the Prince Consort, was appointed by the Commission to consider the matter, no decision respecting it was then arrived at. The Committee venture to think that such an application might be repeated with advantage at the present time, when there

* This evidence, as well as the other documents referred to, have appeared from time to time in the *Journal.*

is a prospect of the Academy entering upon a more extended sphere of usefulness.

12. Convenient and ample premises for transacting the work of the Royal Academy are an urgent necessity; and probably three years must elapse before they can be built even after the funds are obtained. In the meantime the Academy, being obliged to vacate its present premises in Tenterden-street, is seeking to obtain temporary shelter elsewhere. During this transitional period the Committee consider that every effort should be made by the Academy to enlarge its basis of action and to establish an effective system of responsible administration. This can be secured only by the appointment of a director, of proved administrative ability, entrusted with full authority. When the public are satisfied with the promise of an efficient Academy, it may be expected that they will contribute towards the erection of suitable premises.

13. The Committee abstain from offering any further suggestions in detail until they find that the principles they have ventured to lay down are generally approved.

(Signed) Gerald Fitsgerald.
G. Clerk, Bart., *Chairman of the Committee of Management of the Royal Academy.*
J. E. Harington, Bart.
J. P. Boileau, Bart.
Francis Sandford, Kt.
W. Hawes.
Robert K. Bowley.
E. A. Bowring, C.B.
Harry Chester.
Henry Cole, C.B.
J. F. D. Donnelly, Capt., R.E.
J. Puttick.
Samuel Redgrave.
Henry Scott, Lieut.-Colonel, R.E.

Society of Arts, Adelphi, 27th June, 1866.

This Report has been ordered to be printed, and will be taken into consideration by the Council on an early day.

FINAL EXAMINATIONS, 1866.

In the list of Candidates, published in the *Journal* for the 8th June, for "146—Smith, James, 20, Bradford M.I., railway clerk—Arith. (1st)," read "146—Firth, James, 20, Bradford M.I., railway clerk—Arith. (1st)."

Proceedings of Institutions.

Metropolitan Association for Promoting the Education of Adults.—The third annual gathering was arranged to take place at the Crystal Palace, on the 18th June, but the weather on that day was so unfavourable that, although the attendance was large, the out-door amusements were necessarily postponed. The athletic sports were therefore held on Monday, the 25th June, the hour chosen being half-past six p.m., a convenient one for those expected to take part. The sports included a flat race of 100 yards, for persons of any age, and another of the same distance for youths under 16; flat races of 500 yards and one mile; a hurdle race of 200 yards with ten hurdles; running high jumps, and running long jumps; putting the stone (28 lbs.), and throwing the hammer (16 lbs.). There was also a special flat race of 300 yards for men over 40 years of age, a sack race, and a "consolation" hurdle race of 200 yards. Prizes varying in value from £1 and a medal to £5 were given. The sports went off very successfully, Sir Francis Sandford, the chairman, Mr. Benjamin Shaw, and other members of the committee being present. The prizes were afterwards distributed by Sir Francis Sandford.

Rochdale Lyceum.—The last report states that though the number of members is smaller than in the year 1864, the state of the funds exhibits an improvement, caused by increased letting of their rooms. The amount owing by the Society is about £85, showing a reduction from last year of near £30. The committee desire to impress upon the members the necessity of soliciting their friends to join the Institution, as by so doing the debt, which is now comparatively small, would be liquidated, and the society placed upon a better basis. The treasurer's account shows that the receipts have amounted to £230 8s., and that there is a balance in hand of £16 15s. 11d.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page 555*).

GEOMETRY.

THREE HOURS ALLOWED.

To obtain a First-class Certificate, at least six problems and four propositions must be correctly done; to obtain a Second-class, at least four problems and eight propositions.

1. Draw a straight line perpendicular to a given straight line from a given point without it. Is Euclid's method always practically applicable?

2. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of one of them greater than the angle contained by the two sides equal to them of the other, the base of that which has the greater angle shall be greater than the base of the other.

3. Equal triangles, which are upon the same base and upon the same side of it, are between the same parallels.

4. If a straight line be bisected and produced to any point, the rectangle contained by the whole line thus produced, and the part of it produced together with the square of half the line bisected, is equal to the square of the straight line which is made up of the half and the part produced.

5. A segment of a circle being given, describe the circle of which it is a segment.

6. If from an external point two lines be drawn, one of which cuts a circle and the other touches it, the square of the touching line is equal to the rectangle under the segments of the cutting line.

7. Describe an isosceles triangle having each of the angles at the base double that of the vertical angle.

8. If the sides of two triangles about each of their angles be proportionals, the triangles shall be equiangular.

9. Equiangular parallelograms have to one another the ratio which is compounded of the ratios of their sides.

10. The rectangle contained by the diagonals of the quadrilateral figure inscribed in a circle, is equal to both the rectangles contained by its opposite sides.

11. Draw a straight line perpendicular to a given plane from a given point above it.

12. If a solid angle be contained by three plane angles, any two of them are greater than the third.

Problems.

1. Bisect a parallelogram by a straight line perpendicular to one of the sides.

2. The perimeter of an isosceles triangle is greater than that of an equal rectangle of the same altitude.

3. Find a square equal to the sum of two given rectilineal figures.

4. Given the base, the perpendicular, and sum of the sides of a triangle, construct it.

5. A ladder, AB, resting against a wall, CB, and on the horizontal ground, CA, begins to slide down. Show that the middle point of the ladder describes a circle round C.

6. If a circle roll within a circle of twice its diameter, any point in the first circle will trace out a diameter of the other.

7. Inscribe a circle in a given sector of a circle.

8. The opposite sides of any equiangular rectilineal figure must be parallel when the number of sides is even.

9. Find three points in the sides of a triangle, such that when they are joined the triangle shall be divided into four equal parts.

10. If A be the area of any triangle, prove that the area of a triangle whose angular points divide the sides of the former in the ratio of n to 1, is equal to $\frac{n^2 - n + 1}{(n+1)^2}$ A.

MENSURATION.

THREE HOURS ALLOWED.

1. Find the cost, at 3s. 10d. per yard, of the following pieces of oil-cloth: viz, 4 ft. 6 in. by 2 ft. 2 in.; 3 ft. 4 in. by 2 ft. 2 in.; 1 ft. 2 in. by 8 in.; and 1 ft. by 2 ft. 6 in.

2. The parallel sides of a trapezoid are 5 and 7 feet, and the diagonal, which is at right angles to these sides, is 7 feet; find the area and the other diagonal.

3. The area of a rectangular field is 2 acres 2 roods 32 perches, and its breadth is 300 links; find the number of hurdles, each two yards long, which will be required to enclose it.

4. Prove that a cord with its ends joined will enclose a greater area when in the form of a square than in the form of a triangle.

5. The area of a side of a cube is 21 feet 112 inches; find the solid content of the cube, and the length of its diagonal.

6. Give some method of arriving at the ratio which the circumference of a circle bears to its diameter.

7. The outer and inner circumference of a circular ring are 26 and 18 feet; find the area of the ring.

8. Find the radius of a segment-arch, having given the span and the rise.

9. A hollow cylinder, made of a material one-fifth of an inch thick, measures 22 inches round on the outside, and is 10 inches deep; find how many pints it will contain.

10. How many bullets, half an inch in diameter, may be made from a cwt. of lead the specific gravity of which is 11·2?

11. The solid content of the frustum of a pyramid is 259 feet 432 inches, the area of its two ends 48 and 75 feet; find its height.

12. A common garden pot is 21 inches round the top, 15 round the bottom, and 7 down the side; find the shape and size of a piece of paper which will surround it.

TRIGONOMETRY.

THREE HOURS ALLOWED.

1. If the unit of angle be an angle the subtending arc of which is twice the radius, what would be the numerical representation of 90°?

2. If $\tan.^2 x = \tan. (a-x), \tan. (a+x)$, then will $\sin. 2x = \sin. a \sec. \frac{\pi}{4}$

3. Find x from the equation—

$$1 + \cos. (x+a) = \cos.^2 (2x-a) + \cos.^2 (x-2a)$$

4. If versed sin. $A = \frac{1}{13}$, find the other trigonometrical ratios.

5. Find the 540th root of ·00007, having given—

log. 7 = ·8450980; log. 9·824394 = ·9923057

6. Express the area of a quadrilateral figure in terms of its diagonals and their inclination.

7. Prove that—

$$\tan.^{-1} a + \tan.^{-1} b = \tan.^{-1} \frac{a+b}{1-ab}$$

and thence deduce a rapidly converging series for the calculation of π.

8. If C be an angle of a triangle, of which the sides are a, b, c, prove that—

$$c = (a-b) \cos. \frac{C}{2} \sqrt{1 + \left(\frac{a+b}{a-b} \tan. \frac{1}{2} C\right)^2}$$

9. If $2S = a + b + c$, show that the area of a triangle

$$= \sqrt{S. (S-a)(S-b)(S-c)}$$

and that it is rational, if $a = xy(u^2 + z^2) : b = uz (x^2 + y^2) : c = (yu + xz)(yz - ux)$.

10. A hexagon is inscribed in a circle radius r, and the alternate angles are joined, the joining lines forming another hexagon. Prove that the area of this last hexagon is $\frac{\sqrt{3}}{2} r^2$

11. If O be the centre of the circle inscribed in the triangle A B C; $\angle$ A O B $= \alpha$: $\angle$ A O C $= \beta$: $\angle$ B O C $= \gamma$; then

$$4 \sin. \alpha \sin. \beta \sin. \gamma = \sin. A + \sin. B + \sin. C$$

12. If $2 \cos. A = x + \frac{1}{x}$, prove, without assuming De Moivre's theorem, that—

$$2 \cos. 4A = x^4 + \frac{1}{x^4}$$

13. Given $a = 85·63$ $\angle$ C $= 48° 24'$
$b = 78·21$ find A and B

log. 1·6384 = ·2144199 L. cot. 24° 12′ = 0·3473497
log. 7·42 = ·8704039 L. tan. 5° 45′ = 9·0030066
Diff. for 1′ = 1265·5

14. Define the polar angle of a spherical triangle, and prove that its sides and angles are the supplements of the angles and sides of the primitive triangle.

15. Assuming the relation between the three sides and an angle of a spherical triangle, deduce the relation between the three angles and one side.

16. Investigate the formula—

$$\tan. \frac{1}{2}(A-B) = \frac{\sin. \frac{1}{2}(a-b)}{\sin. \frac{1}{2}(a+b)} \cot. \frac{1}{2} C$$

17. Hence prove that—

$$\sin. \frac{1}{2}(A-B) \sin. \frac{1}{2} c = \sin. \frac{1}{2}(a-b) \cos. \frac{1}{2} C$$

(To be continued.)

REPORT ON THE MILITARY SCHOOL OF MUSIC, KNELLER HALL.

I.—Origin.

In the British army (which is peculiar in this respect) the cost of maintaining the regimental bands falls upon the officers. In the infantry, a sergeant, a corporal, and nineteen privates,—and in the cavalry, a sergeant, a corporal, and fourteen privates,—are taken from the effective strength of each regiment to form the band. The public provide only the ordinary regimental pay, the rest of the pay, and the entire salary of the bandmaster, if a civilian, together with the cost of music and musical instruments, are provided out of the "Band Fund," which is raised by "stoppages" from the officers on first appointment and promotion, and by annual subscriptions. The ordinary band subscription is thirty days' pay (according to rank) on appointment; on promotion the difference between the pay of the former and the present rank for a like period, and twelve days' pay per annum.

The band fund of each regiment is managed by a committee of the officers. In discharging the duty thus imposed upon them, the following difficulties were experienced:—

1. Owing to the scarcity of trained performers, and the superior remuneration to be obtained by them out of the army, there was always a deficient supply of suitable can-

didates for the military bands, which had consequently to be recruited from such materials as were ready to hand in each regiment. The men selected were generally destitute of musical knowledge and skill; they had to be taught everything, and they depended to a large extent for their instruction upon the band sergeant and the older bandsmen. Under these circumstances, any high degree of efficiency was impossible, and such efficiency as could be attained was constantly liable to interruption from casualties, owing to the inadequacy of the number of regimental musicians sanctioned by authority.

2. It was still more difficult to retain the men after they had acquired some skill. They then naturally endeavoured to carry their talents to a better market, and there was nothing to restrain their freedom of action in this respect, whenever, by saving money enough, they found themselves in a position to purchase their discharge. This inconvenience became aggravated by the introduction of the short Enlistment Act.

3. Moreover, the bandmaster himself not being attached, as an enlisted soldier, to the regiment, could transfer his services from one regiment to another, and could refuse to accompany a regiment when ordered on foreign service. He held office under an engagement terminable by a short notice, and the officers had no hold upon him except the inducement of a higher rate of pay than he could obtain elsewhere.

4. The bandmasters being thus, with few exceptions, civilians, the large salaries they received had, owing to the comparative absence of competition, a constant tendency to increase, and little or nothing was left in the band fund with which to encourage talent and application on the part of the bandsmen.

5. The bandmaster, on changing from one regiment to another, not unfrequently upset the arrangements of his predecessors, both as to instruments and music, thereby putting the officers to fresh expense, and throwing the bandsmen back in their practice.

6. The variety of methods and instruments adopted by different bandmasters, combined with the want of a uniform pitch in the instruments, rendered it impossible for several bands to play together.

7. The civilian bandmasters, though they might be good conductors, were not generally qualified by any special training for the far more important work of teaching the bandsmen, and having no military rank, they were neither amenable to, nor capable of enforcing, military discipline.

It was with a view of removing the difficulties above detailed, and of ensuring an adequate supply both of properly trained bandmasters and musicians for the army, that in the year 1856 the idea of establishing a military school of music was entertained by the present Commander-in-Chief, the Duke of Cambridge, and it having been ascertained that the proposal met the approval of the regimental officers, his Royal Highness, in concert with the Secretary of State for War, took measures for carrying it into practical operation.

The Government establishment for the training of schoolmasters at Kneller Hall, Whitton, near Hounslow, had been broken up by the Committee of Council on Education in 1855, and the building had not yet been applied to any other purpose. As it appeared to be in most respects adapted for receiving the proposed school, application was made to the Lords of the Treasury for its transfer to the War Department, and the transfer having been sanctioned, and the necessary appointments of professors made, a circular was issued announcing the establishment of the school, calling upon commanding officers to send men and boys to be trained as musicians for their several regiments, and giving an estimate of the amount of subscription that would be required towards its support. The school was opened for the reception of pupils on the 3rd March, 1857.

II.—Organization.

The institution, as regards its organization, must be viewed under two separate aspects, (1) as a military barrack, (2) as a school of music.

1. As a military barrack it is under the direction of the Secretary of State for War, and is subject to the same regulations as any other barrack.

2. As a school of music, Kneller Hall is conducted under the direction of the Commander-in-Chief, from whom emanate the regulations connected with the admission of pupils, and the course of study. A military officer is appointed to command the detachments under instruction, and he, in concert with the professors, judges of the musical capabilities and acquirements of the pupils, and makes recommendations accordingly to the officers sending them. The musical staff is composed of nine permanent professors, four occasional professors, and a varying number of special assistants, who are selected from the first-class students. The professors are all civilians.

There is also a schoolmaster (Mr. Cole) for the instruction of the students in general knowledge, who takes each of the classes during one hour daily, and religious instruction is given by a military chaplain, under the same regulations as in other army schools.

The sick of this detachment are sent to the hospital at Hounslow Barracks, and the surgeon of the regiment at that station visits the institution weekly.

The following are the names of the professors at present engaged, and of their special assistants, with the number of lessons given by them per week, and the distribution of their duties:—

Professors and No. of hours per week.	Special Assistants.	Duties of Professors.
1. Permanent:—		
Mr. Mandel (40)	Scott	General theory of music, instrumentation of military bands.
" Lazarus (13)	...	Clarionet.
" Martin (28)	Kennedy	"
" Park (13)	Moran	"
" Snelling (13)	...	Bassoon.
" Hartmann (13)	Hutchinson	Flute.
" Zeiss (28)	Laye, Traise	Trumpet and tenor brass instruments.
" Mann (28)	Mooney	French horn.
" Sullivan (28)	Davis	Bass brass instruments.
2. Occasional:—		
Mr. Barrett	Miller	Oboe.
" Hawkes	...	Trombone.
" Hughes	Wheatley	Euphonium.
" Phasey	...	"

In addition to these paid instructors, the rest of the pupils in the first class are required to take part in the instruction, with the double object of affording them practice as teachers, and of gaining increased teaching power for the elementary classes, which have to be drilled in the merest rudiments.

III.—Instruction.

The following is a list (classed according to register) of the instruments taught at Kneller-hall:—

Soprano.—Piccolo, flute, oboe, E♭ and B♭ clarionets, cornet, saxophone, trumpet.

Alto.—E♭ alt clarionet, althorn, trumpet.

Tenor.—French-horn, tenor trombone, saxophone.

Bass.—Bassoon, B♭ bass-clarionet, saxophone, bass-trombone, euphonion, bombardon.

The students are divided into four classes—

1st (Highest) Class, chiefly theoretical instruction.
2nd Class, practical and theoretical.
3rd " elementary and practical.
4th " elementary.

The theoretical instruction is given to each class entire—slight differences of progress are here rather an advantage than a hindrance. For the practical instruction, the classes have to be sub-divided, according to the instruments to be learnt. The students in each sub-division are taught, as far as possible, in groups of two or more, but the great diversity of skill and proficiency existing amongst them, renders much individual tuition necessary.

The hours of study are—Mornings, from 8.45 till 12.30.

Afternoons, from 1.45 till 5 (in winter 4). Thus seven (in winter six) hours a day are devoted to obligatory study, during which time the students are receiving direct instruction, taking part in rehearsals or performances, or practising their respective instruments, under the supervision of a sergeant capable of affording them guidance. Practically, however, this period is very considerably increased, for the desire to make progress leads the students to engage in voluntary practice out of school time; so much so, that it has been found necessary, both for their own health, and for the comfort of the other inmates of the Hall, to prohibit all practice after a certain hour (6.45) every evening. Saturday is a half holiday.

The course of study generally occupies two years.

The higher course of study (for students who are in training for bandmasters) comprises, besides practical instruction in playing and teaching the instruments composing the band, some general acquaintance with the theory of harmony, counterpoint, and instrumentation. The aim in the theoretical instruction of these students is, not so much to make them composers, as to enable them to arrange or "score" music for the instruments of a military band. This they practice regularly, taking their scores to the theoretical professor for revision at certain hours appointed for that purpose, and in the reports furnished to his Royal Highness the Commander-in-Chief, long lists are given of music arranged or composed by them.

They also receive practical training in the duties of a conductor, by actually conducting at the rehearsals and public performances of the Hall band. One of these performances takes place every Friday afternoon, when a considerable assemblage of visitors is usually attracted; besides which, there are, in winter, occasional evening concerts. In addition to ordinary military music, classical pieces of concert and chamber music, specially arranged for wind instruments by the theoretical professor, are performed.

Although the students may never be called upon to play or conduct such music in their regiments, it is considered desirable to form their taste upon the highest models of the art.

The members of this class are generally bandsmen of some service and experience in their vocation, some of them band serjeants.

The Rev. Hugh Huleatt, 1st class chaplain, performs divine service to the detachment on Sundays, in the Hall Chapel. The service is choral, the boys and men who possess the best voices being selected to form the choir.

Besides the above mentioned instruction, the advantage of cheap admissions to the operas, and principal concerts of the metropolis, is occasionally obtained, partly through the liberality of the managers, and partly at the expense of the institution, to such of the advanced students as are recommended for diligence by the professors. As many as 900 of these cheap admissions have been enjoyed by them in the course of one year. On these occasions, the directors of the South-Western Railway Company have, with similar liberality, greatly reduced their fares in favour of the students. Independently of admissions at low prices, many students obtain leave to attend the operas entirely at their own expense. The opportunity of hearing good music is not one of the least advantages gained by the pupils of Kneller Hall. Situated as it is within easy distance of the metropolis, it affords them the best means of forming their taste, and must give a fresh impulse to their studies. It is highly creditable to the moral discipline of the institution that no instance has yet arisen in which a student has abused this privilege.

IV.—Pupils.

The pupils are selected from the various regiments being often enlisted into them for the purpose), and are sent to Kneller Hall as vacancies occur.

Supplies of boys to be trained for the bands are obtained by the regimental officers from the Royal Military Asylum, Chelsea, the Royal Hibernian Military School, Dublin, and the large Metropolitan Poor-law Schools. Instruction in military music has been introduced into these last mentioned institutions on the recommendation of her Majesty's inspector, Mr. Tufnell, as part of the industrial training, in order to prepare the more musical among the pupils for earning a livelihood as musicians in the bands of the army and navy.

Kneller Hall, through one of the reports of the commandant, has been the means of making known to the Band Committees this method of obtaining young bandsmen without employing expensive agency, or paying a premium to any person for them. The number supplied by the two Government schools above named is, however, quite inadequate to the wants of the service. It is recommended that lads should not be sent to Kneller Hall before the age of fifteen.

Each candidate proposed for admission must be examined by the surgeon of his regiment, and certified by him to be in perfect health, and physically fit for instruction as bandsman, presenting no indication of any disease likely to be aggravated by playing on a wind instrument.

During the first few months after admission, the pupils are on probation only, and those who are manifestly disqualified for the pursuit, are sent back to their regiments. Whether those who remain shall be trained as bandmasters or bandsmen depends solely on their commanding officers, and in the latter case the instrument each shall be taught is determined partly by the wishes of commanding officers, and partly by the opinion of the professors as to the capabilities of their pupils. Each student, on leaving, receives a certificate of his qualifications from each of the professors under whom he has studied. Thus a student who has passed successfully through the whole course of instruction, and is qualified to act as bandmaster, accumulates testimony to his qualifications from a number of independent and competent judges. These reliable guarantees of his professional ability are calculated—not only to ensure his attainment of the position which has been the object of his training and his hopes, but—to furnish the officers with evidence to which they can appeal in justification of that preference which they naturally wish to give to a duly qualified military bandmaster, trained at their own expense, over a civilian who will cost them more.

V.—Advantages secured to Bandmasters who have passed through Kneller Hall.

A military bandmaster is now sanctioned by the Government for every regiment and battalion throughout the service, provided there is one available who has been trained and qualified for the appointment at Kneller Hall, and bandmasters so trained enjoy the pay and position of a 1st class staff-sergeant; they receive a salary of £100 a year from the Regimental Band Fund, in addition to their regimental pay. They rank with the schoolmaster, next to the regimental sergeant-major, according to date of appointment, and receive a higher rate of pension in accordance with their rank as 1st class staff-sergeant.

When in garrison, or brigaded, they take precedence over civilians, and when bands are playing together, they lead according to seniority of appointment.

When a soldier is sent to Kneller Hall to be trained for bandmaster, he is allowed to remain there until he has proved his fitness for the position or otherwise.

In the former case, he returns to his own corps in that capacity if required; but, if not, he is transferred to another regiment, where his services may be made available.

Military bandmasters, holding the rank of first-class staff serjeants, cannot serve in a subordinate position under another bandmaster, or in the inferior capacity of band serjeant.

If, however, a man proves himself to be incompetent for the situation, he returns to his regiment.

No system of rewards or honorary distinctions for

bandsmen has hitherto been established, but it is felt that some such system is required in order to promote the efficiency of the bands, especially as the soldiers, by entering them, lose the ordinary chances of promotion.

Some commanding officers have adopted a plan for rewarding merit among the bandsmen from the regimental band fund, and this they can now better afford to do since the bandmaster's salary is no longer so severe a tax upon their resources, and also since the introduction of the new system for reducing the price of band instruments to the army.

VI.—Finance.

The expenses connected with Kneller Hall as a military barrack are defrayed by the government. They include the original and incidental expenses of the building, and its furniture, the cost of clothing the men, the pay of the commandant (the present one is on half-pay), chaplain, surgeon, normal schoolmaster, and students (for they continue in receipt of their regimental pay). All the articles of food which the students require, beyond the daily rations, are purchased by themselves. They mess together, the soldiers forming one mess, the non-commissioned officers another, as in ordinary barracks, except that, in accordance with the educational character of the establishment, more than ordinary regard is had to their comfort in the arrangements made for their meals. The pay of the students is drawn from the paymaster of the London district by means of pay lists furnished to him by the officer commanding, who disburses the same, through his pay-serjeant, to the troops daily.

The expenses connected with Kneller Hall, as a school of music, are defrayed by the regimental officers. An original subscription of £5 was paid, by each regiment, to provide the requisite supply of musical instruments, the cost of which was between £500 and £600, and £8 is subscribed annually for the current expenses. These include the salaries of the professors, amounting in the aggregate to about £1,100 per annum, charges for copying and arranging music, replacement and repairs of instruments, stationery, postage, and other incidental expenses. The commandant has no salary, and he receives no remuneration for his services except the use of the apartments in which he actually resides. By a rigid economy in the administration of the funds, the expenditure has been kept within the original estimate, upon which the band committees were induced to cooperate with the authorities in establishing the school.

The accounts are periodically audited by official auditors.

VII.—Number of Pupils Admitted and Results Obtained.

The health, conduct, and progress of the students have been remarkably good.

The subjoined table is compiled from the reports presented to the Commander-in-Chief, for the several periods, by the commandant.

Period.	Admitted.	Of whom: Knew little or nothing of music.	Of whom: Practical musicians.	Left the School: As bandmasters.	As bandmen.	Disqualified.	For misconduct or idleness.	Deserted.	Died.	Special.	Total.
From 3rd March, 1857, to 31st December, 1858 ...	147	114	33	5	29	13	8	3	...	1	59
From 31st December, 1858, to 31st December, 1859	79	71	8	4	41	5	4	1	...	...	55
From 31st December, 1859, to 31st December, 1860	59	37	22	9	29	1	9	1	...	...	49
From 31st December, 1860, to 31st March, 1862 ...	83	61	22	7	38	9	5	1	2	1	63
From 31st March, 1862, to 31st March, 1863 ...	79	52	27	11	59	4	...	3	1	...	78
From 31st March, 1863, to 31st December, 1864 ...	145	94	51	27	75	6	7	3	5	7	130
Totals...........	592	429	163	63	271	38	33	12	8	9	434
Remaining under instruction											158
Total (agreeing with column 1)........											592

From this summary it appears that the average number of students annually admitted is 74, the average number in attendance, 148; the average number annually returning to their regiments, who have completed their two years' course of musical training, 37 (or 50 per cent.), of whom 9 have been qualified for the position of bandmaster.

It will also be seen that the institution has had to contend against a serious difficulty, arising from the large proportion (73 per cent.) of students who have had little or no previous training. The commandant has, in several of his reports, mentioned this difficulty, and pointed out the necessity of making a good choice of the materials out of which, in the short time for which the pupils can be spared from their regiments, musicians are to be produced.

As regards the ability, conduct, and attention to duty of the men, after their return to their regiments, the commanding officers have invariably reported in terms of high approval. A practical proof of the high estimation in which Kneller Hall bandmasters are held by commanding officers, is afforded by the fact, that when by death, or other casualty, a regiment has been deprived of the services of one of them, application has nearly always been made for another to replace him.

VIII.—Collateral Results Obtained.

In connection with Kneller Hall, a system for reducing the cost of band instruments has been introduced with the sanction of the Commander-in-Chief. These instruments are now supplied to the officers upon requisitions forwarded to the Horse Guards, and executed through the medium of Kneller Hall, instead of being obtained as formerly direct from the dealers, at a price enhanced in proportion to the premium which it was usual to allow to the civilian bandmasters.

Arrangements have been made with certain makers, in pursuance of which a discount of 25 per cent. is allowed to band committees purchasing through this channel.

The plan appears to have worked very successfully, as most of the regiments in the service have already benefited thereby. The instruments supplied, whether ot foreign or British manufacture, are of the best description, and have been with scarcely an exception, highly approved of by the band committees.

To enable the bands of all corps throughout the army to play in concert, the Commander-in-Chief has ordered that the instruments of the whole shall be one uniform pitch, and that used at the ancient philharmonic concerts has been selected as the standard, or regulation pitch of the army. Each regiment has been supplied with a tuning fork of the proper pitch, at the cost of the fund of the Military School of Music.

This pitch gives 433 vibrations per second for the note A, and, as compared with the existing concert pitch in England (A = 455) is a semitone lower. In was in use in the Philharmonic Society, under Sir George Smart, from 1812 to 1842, was settled in the first instance by practical musicians, and was shown by long experience to be a good pitch for instrumental music. It is nearly identical with the pitch (A = 435) which has been adopted by the French Government, on the report of the commisson appointed in 1859 to inquire into the subject, and is practically but little different from the theoretical or scientific pitch (A = 426$\frac{2}{3}$).

A return to this pitch has long been felt to be desirable as regards wind instruments, both for improving their tone and facilitating performance upon them. No difficulty

has been experienced in effecting this change in the instruments of the army.

IX.—CONCLUSION.

The objects contemplated in the foundation of the Military School of Music have been successfully attained.

1. There is now a constant supply of trained performers for the regimental bands, though it is still inadequate to the wants of the service.

2. These bandsmen, having received a good professional education, through the liberality of the Government and their commanding officers, are bound to serve in the army by a moral obligation, arising from the gratitude which they naturally feel towards their benefactors, and from the contract implied in their acceptance of the benefit. They have also a new object of ambition in the chance of future promotion to the post of bandmaster, as a successful musician trained at Kneller Hall, usually leaves it with the hope of returning some day to qualify himself for the higher position. It was at first supposed by some persons that the superior education given to bandsmen, through the agency of Kneller Hall, would have the effect of raising them above their work, and would thus increase, instead of diminishing, the inducements to leave the service. But the result has proved the contrary; a much smaller proportion of Kneller Hall bandsmen, than of others, have obtained their discharge, the per-centage in the latter case being about ten times as great as in the former; and it will be found that a large majority of those who have rejoined their regiments as efficient musicians, have since become non-commissioned officers.

3. There is a greater degree of permanency about the engagement of the bandmaster, and he feels a greater interest in the success of the band because he is a member of the regiment, and shares in its *esprit de corps*.

4. There is also a constant supply of bandmasters, who, on account of the education bestowed on them, and the fact of their being soldiers, may be obtained at a much less cost to the officers than the civilians who were employed heretofore.

5. The arrangement of the bands is less liable than formerly to be upset on a change of bandmasters, because the new bandmasters have all been educated in the same school, and on the same principles.

6. The bandsmen having, in like manner, been trained according to one method, and uniformity of pitch having in the meantime been established, the bands of different regiments can now perform in concert.

7. The new bandmasters have all received practical training in teaching, as part of their professional education, and, holding a recognised and well-defined rank in their regiments, they are better qualified than civilians to maintain good order and discipline among the soldiers placed under their charge, while they are also amenable to discipline themselves.

It only remains to be hoped that the time may come when the officers of the army shall be relieved from the tax, now imposed upon them, of maintaining the regimental bands at their own expense,—and when, as in all other states, the military music of the country shall be admitted as a charge on the national revenue, quite as legitimate as the cost of providing the arms and equipments of the soldier.

PARIS UNIVERSAL EXHIBITION OF 1867.

WEIGHTS, MEASURES, AND COINS.

On the suggestion of the Metric Committee of the British Association for the Advancement of Science, and of the Council of the International Decimal Association, the Imperial Commission for the Paris Universal Exhibition have resolved to have a special exhibition of the measures, weights, and coins of all countries, and to hold conferences at the same time, with a view to the establishment of one common system throughout the world. The two scientific bodies deputed Prof. Leone Levi to proceed to Paris, to meet M. Le Play, the Commissaire-General, and after a conference with the commissioners of different countries, called for the purpose, the Minister of State issued the following ordinance on the subject:—

The Imperial Commission, taking into consideration the ordinance of 20th September, 1865, which establishes a Scientific Commission, states:—

The Scientific Commission has for its object to concur in extending the use of useful discoveries, and promote reforms of international importance, such as the adoption of the same weights and measures, common scientific units, &c. Taking into consideration also the propositions of two scientific societies in England,* propositions which include, first, the project of an international exhibition of measures, weights, and coins; secondly, the project of a conference, to take place in 1867, for the adoption and extension of a uniform system of measures; and considering the adhesion given to the above propositions by a conference held on the 2nd and 14th May, 1866, to consult as to the means for resuming the labours of the special commission formed at the Universal Exhibition of 1855, has decreed as follows:—

Art. 1.—A special place is appropriated in the vestibule of the Palace of the Champ de Mars, to an international exhibition of measures, weights, and coins of all countries.

Art. 2.—A special committee on measures, weights, and coins is established in the Scientific Commission to preside over the formation of this exhibition.

Art. 3.—The committee is besides called upon to use the most efficient means for taking advantage of the universal gathering of 1857, for the adoption and extension of a uniform system of measures, weights, and coins.

Art. 4.—To attain this object, the committee will place themselves in correspondence with the persons who have already taken part in the conferences of 1855 and 1866, and the principal persons of all countries whose assistance may be desirable.

The following are nominated members of this committee:—MM. Baudrillard, Member of the Institute, Professor at the Conservatoire des Arts et Métiers; Leone Levi, Professor of Commercial Law at King's College, London, Doctor of Political Economy, and delegate to the two above-mentioned scientific societies; Mathieu, Member of the Institute and of the Bureau des Longitudes; Peligot, Member of the Institute, Professor at the Imperial Conservatoire des Arts et Métiers, and Verifier of the Assays at the Mint.

Art. 5.—Other members of the same committee will afterwards be nominated—persons designated by the foreign commissioners of the states which will contribute to the special exhibition of measures, weights, and coins.

Art. 6.—The Conseiller d'Etat Commissaire-Général is charged with the execution of the present ordinance.

THE DEMOLITIONS AND EMBELLISHMENTS OF PARIS.

Antiquarians who desire to have a look at the last remnants of some of the most celebrated and least savory quarters of Paris must pay an early visit. The clearances for the new hospital of the Hôtel Dieu are sweeping away the rues d'Arcole, Constantine, de la Cité, the quai Napoleon, and the celebrated but wretched street the Rue des Marmousets. The pick-axe has already made its way through the rues Boucher, Etienne, Saint Germain l'Auxerrois, and a number of wretched alleys, for the course of the new street which is to lead direct from the Pont Neuf to the great central market. A great portion of the streets bordering on the Halles,

* Metric Committee of the British Association for the Advancement of Science; International Association for obtaining one uniform Decimal System of Measures, Weights, and Coins.

with the heavy pillars of the old colonnade, the sites of the birthplace of Molière and of the murder of Henry IV., the remnants of the old monastery and cemetery of the Innocents, are giving place to the new buildings which will complete the great market and connect it with the great circular building in which the corn market is held.

The repairs of the church of Notre Dame are nearly completed. All the side chapels are decorated and furnished with stone altars and statues of the saints to whom they are dedicated. In each are placed a crucifix, bronze and gilt candelabra in the style of the fourteenth century, and other emblems and ornaments. The great doors of the northern porch are just completed. In the centre of the parvis, or place in front of the church, is to be erected an ornamental column to replace that which formerly stood there, and from which the distances on the whole of the great roads throughout the country are measured.

On the south side of the river another great street, to be called the Rue de Solférino, is about to be pierced, and the new Boulevard Saint Germain is to be continued to the Palais Bourbon, in which is the chamber of the Corps Legislatif. These alterations will destroy a large number of celebrated mansions—the hôtel of the family of de Noailles, a fine old house with a noble terrace looking towards the Seine and facing the Louvre; a part of the hôtel of the Duc de Broglie, in the Rue de l'Université; and also that occupied at present by the Pope's Nuncio, as well as the whole or a portion of the residences of the families of La Ferté, de Forbin, and de Luynes; the proprietor of the last named, the Duc de Luynes, having had his garden taken for the streets in question, has put up his hôtel for sale. On the site of the building now occupied by the Chancellor of the Legion of Honour, it is proposed to erect a palace for the President of the Conseil d'Etat, which will occupy the angle formed by the new Rue de Solférino with the quay.

The London system of erecting places of refuge for pedestrians at the intersections of wide roads and streets is being carried out in various parts of Paris, where such means of safety had become absolutely necessary from the width of the places and the growing increase in the traffic. Many of these refuges are already completed; they consist uniformly of a piece of circular pavement, having in the centre an elegant candelabrum of large size, consisting of a beautiful casting in Florentine bronze, the stem being decorated with ornaments in bas-relief, and supporting five gas lights in elegant oval semi-opaque lanterns, four in a circle and one above; the candelabra stand on circular plinths of the stone of the Jura, between four and five feet in height, ornamented by machinery with bold mouldings and polished. In one place, where occurs the junction of the Boulevards Malesherbes and Haussmann with three streets, there are three of these useful refuges with their beautiful candelabra.

In connection with this subject may be mentioned an undertaking of the Prefect of the Seine, commenced some years since, namely, a collection of all the documents connected with the administration and public works of the city. One of the chief objects of this *bureau historique* is the compilation of a work to be entitled the "Government of Paris and the History of the Prévôté des Marchands," or trade corporation. An introductory volume has been printed, if not published, containing the plans of the work, by Baron Haussmann, and a note from the Emperor felicitating the prefect on his project of producing a general history of Paris.

THE PLAGUE OF LOCUSTS IN ALGERIA.

All the accounts of the serious character of the recent visitation of Algeria by locusts, are confirmed and even strengthened by a circular addressed by Marshal Canrobert. It appears that the creatures first appeared during the month of April; coming from the gorges of the mountains, and the fertile valleys of the littoral, they descended first on the plain of the Mitidja and the Sahel of Algiers. Their mass, at certain points, intercepted the light of the sun, and produced an effect similar to that of the snow storms which, in the winter season, fall in Europe, and blot out even the nearest objects from the sight. The vegetation of the country offered an attractive bait to the destructive insects. A large portion of the colza, oat, late barley, and vegetable crops were immediately destroyed, and in some parts even the interiors of houses were invaded.

The Marshal used all his endeavours in encouraging the population in their efforts against the invaders; by his orders the troops were called out to help the colonists to combat the plague, and the Arabs, whose interests were also at stake, joined their efforts against the common enemy. In a few days enormous quantities of the insects were destroyed; but human efforts had little effect against these winged multitudes, which fled over the country, and only abandoned one field to fall upon another. It was impossible to prevent fecundation and the deposit of eggs, which quickly gave life to larvæ innumerable, so that the first swarms were soon replaced and centupled by new generations.

The appearance of these young locusts is especially to be dreaded, on account of their voracity; the hungry myriads fell upon everything which had escaped the depredations of their predecessors. They filled up the water-courses, the canals, and the rivulets, and the troops had the greatest difficulty in preserving the water from infection.

Almost at the same time the provinces of Oran and Constantine were invaded. At Tlemcen, where no locusts had appeared within the memory of the oldest inhabitants, the soil was covered with them. At Sidi-bel-Abbès, at Sidi-Brahim, and at Mostaganem they attacked not only the tobacco plantations, the vines, and the fig trees, but also the olive trees, notwithstanding the bitterness of the leaves of the latter. At Relizane and at Harba they invaded the cotton-grounds. The road between Mostaganem and Mascara was literally covered with them along its entire course of fifty miles.

In the province of Constantine the locusts appeared simultaneously from the Sahara to the sea, and from Bougie to Calle. At Batna, at Selif, at Constantine, at Gelma, at Boue, at Philippeville, and at Djidjelly, the people acted energetically against the invasion, but neither fire nor other obstacles offered to the progress of the insects were sufficient to prevent the destruction, which fell principally upon the European settlements.

The damage done is immense, though it is impossible at present to ascertain the exact extent of the mischief, for the work of devastation is going on daily. All that can be done is to assist the unfortunate people whose crops are destroyed, and to furnish bread to the starving families.

This account calls forcibly to mind that of the same kind of plague as recorded in the Bible; such a terrible visitation has not been known in modern times. The Marshal, with the aid of the Archbishop of Paris, the Minister of War, and other official personages, has opened a subscription for the sufferers, and the Emperor, the Empress, and the Prince Imperial have headed the lists with liberal contributions.

THE TELEGRAPHIC SYSTEM.

On the first day in the present year great reductions were made in the telegraphic tariff between various states of the continent, and the *Journal des Débats* has seized the occasion to show how wide-spread

the system has become, and what means of communication now exist in Europe and between that and other parts of the world. It appears that on the 1st of January there existed nearly seven thousand telegraphic offices in Europe. Two lines connected Europe and Africa, one going from Marsala, in Sicily, to Biserta, in Tunis, and being in connection through the lines in the latter country with Algeria; the other line extends from Malta to Bengazhi, in Tripoli, and is then continued to Alexandria, in Egypt, by a cable which runs along the coast. This second line was intended to make part of the great one to India, but the difficulty of preserving a cable on the coral reefs of the Arabian gulf made it necessary to seek another course; its use is therefore limited to communication between Europe and Egypt. The last-named country is also connected with Europe, as well as with Asia, by a line which traverses Syria, touching at Jerusalem, Aleppo, Tripoli, Beyrout, crossing the Bosphorus, and joining the lines of Turkey, in Europe.

Dispatches for India may be sent by two routes. The first is by means of the Italian lines, the cable which connects Otranto and Vallona, and the lines of Turkey, in Europe and Asia, and reaching to Bassora on the Persian Gulf, it then passes by means of cable submerged along the coasts of that gulf and of the gulf of Oman, and is connected with Indian lines at Kurrachee. The second route is by way of Russia, the Caucasus, and Persia, to Bassora. The Indian telegraphs possess one hundred and sixty-one stations, and the island of Ceylon four.

Dispatches for China are now sent by way of Russia, and are transmitted through the lines of Russia proper and Siberia to the Tartar frontier town of Kiachta. From this point they are carried by the Chinese post to Pekin, a journey which occupies fifteen days.

America is not yet brought into telegraphic relations with Europe, but Russia and America are conjointly at work in establishing a line by way of Siberia and Behring's Straits. The third attempt to lay the great transatlantic cable, as is well known, is now occupying the attention of the whole world; and another line, long projected, that of M. Balectrini, is expected to be carried out shortly, through the co-operation of several continental states with the United States Government, or an American company.

THE SUPPLY OF CHEAP SUMMER DRINKS.

The system of what is called "Trink-Halles" has been imported from Germany into Paris, by Captain Fontrobert, with the permission of the municipal authorities. The first trink-halle was set up in Leipzic about ten years since, and the success of the system has been immense. Dresden, Vienna, Berlin, Kœnigsberg, Cologne, Hamburg, and other places, have followed the example of Leipzic.

A society was formed last year in Paris for the introduction of trink-halles in France, with a capital of 6,000, the president of the society being the Baron de Jablens, brother of the general who commands one of the corps of the Austrian army. The municipal authorities of Paris gave permission for the establishment of ten of these trink-halles by way of experiment, and these were set up in the ancient outer Boulevards and in the Boulevard Sebastopol. This year permission has been accorded for nineteen others, of which twelve are now open to the public, so that at the present moment there are twenty-two in operation. The structure consists of a covered stall, constructed somewhat after the Châlet style, of wood, about ten feet in length and four or five feet deep, and open in front at the upper part, in fact a covered *buvette*, or drinking counter.

Only three kinds of drinks are allowed to be sold at these trink-halles—eau de Seltz pure, and the same with currant syrup or with syrup of Seville oranges; these drinks are charged, respectively, two and three sous a glass.

The eau de Seltz is made by the society itself, and confined (like the soda-water, ginger-beer, and lemonade, in English shops) in copper cylinders, coated inside with tin, and these are carried round in carts several times a day to the trink-halles, which are provided with fountains and reservoirs of ice, through which the aerated water is made to pass by means of coiled pipes, thirty feet long, so that the water is always well iced. The pressure in the cylinder is that of ten atmospheres. The syrups are kept in closed porcelain vessels, which are furnished with ingenious taps that give to each glass a fixed quantity of the syrup.

Each trink-halle is attended by two women, who wear simple uniform dresses; they receive two francs and a half a day (equal to two shillings), and have in addition the value of five glasses of the beverages allowed them daily. Trink-halles are furnished with tell-tale counters, which enable the inspectors to see how many glasses of the liquid have been sold during the day. The sale is said to amount, in warm days, to ten and twelve thousand glasses between the twenty-two trink-halles, or, on an average, 500 each, but on dull or cold days the demand is almost *nil*.

Under the present arrangements the trink-halles remain closed during the winter months, but it is said to be in contemplation to allow them to sell hot coffee and tea during cold weather. There is no doubt that—whether during summer heat or wintry blasts,—the trink-halle must prove a friend to temperance, and, consequently, a friend of the poor man.

Fine Arts.

The "David" of Michael Angelo.—A bronze casting of this famous statue was made not long since, and it is now proposed to substitute the cast for the original, and to place the latter in the Palace of the Podesta, where it would be better protected from the ravages of time, than in the open space in which it now stands in the city of Florence. A commission has been appointed to carry out the proposal, and the original statue has been inclosed within wood-work, that experiments may be made in order to ascertain, beyond doubt, whether the removal can be made without chance of injury to the statue.

Architectural Competition.—The Architectural Society of Lyons announces a public competition, open to all nations, for a medical college to be erected on the Quay du Prince Impérial in that city. The ground to be occupied does not exceed 6,000 square mètres; the plans are to consist of one of the ground floor, and one of the upper story, to a scale of five in a thousand, and of an elevation to a scale of one in a hundred. The conditions are to be had on application to the Secretary of the Society, at the Palais des Beaux Arts, Lyons.

Manufactures.

South Carolina Industry.—There are some cotton mills in various parts of the State which manufacture coarse cotton fabrics. They are the:—

Graniteville mill	working	10,000	spindles.
Vaucluse mill........	„	1,200	„
Batesville mill	„	1,400	„
Lester's mill	„	800	„
Bevinsville mill......	„	1,000	„
Grady's mill	„	1,000	„
Total		15,400	spindles.

There are two paper mills, which are engaged in the

manufacture of printing and wrapping paper, viz., one at Bath, producing 3,500lbs. daily, and one at Grenville, 1,500lb. There are also the following iron-works:—The Magnetic Iron Works, at Cherokee Ford on Broad River, in Union district, employing about 300 labourers; the King's Mountain Iron Works, in New York district, at the junction of King's Creek and Broad River; and Bobo's Iron Works, Hurricane Shoals, Pacolet River, in Spartanburgh district. All of these works produce pig-iron castings, rolled bar iron, and nails. The quality of the iron is said to be equal to Swedish, but the quantities obtained have not been ascertained. In Picken's district, South Carolina, the Cherokee Mining Company, with a capital of 150,000 dollars, had, shortly previous to the war, established works for the smelting of gold, copper, and lead, all of which are found in that district in great abundance. About a hundred persons were employed, but being taken into military service by the operation of the Confederate Conscription law, the operations of the company then ceased. All of the land in Picken's district is said to be in a high degree metalliferous, and it can be readily purchased at about five dollars per acre.

Commerce.

Consumption of Tea and Sugar.—The Board of Trade returns (say Messrs. Travers) show a remarkable increase in the quantity of tea entered for home consumption during the five months ending May 31st, as contrasted with the corresponding period of the year 1865; the amount for the present year being 41,608,254 lbs., against 29,643,122 lbs. in 1865, an increase of nearly 12,000,000 lbs.; this does not, however, represent a corresponding increase in actual consumption, as the clearances during the month of May, 1865, were almost nominal in consequence of the reduction of the duty to 6d. per lb., which was announced in April, having been postponed till the 1st of June of that year. As compared with the corresponding five months in 1864 it is not so considerable, being little more than four millions in excess, and this probably represents fairly enough the increase that has resulted from the reduction. Since 1864 there has been a slight but gradual decrease in our exports, which are, in round numbers, represented by 13,000,000, 11,000,000, 10,000,000 lbs., during the five months of the years 1864, 1865, 1866 respectively. A somewhat similar decrease is apparent in our imports, which may be taken as 58,000,000, 57,000,000, and 56,000,000 lbs., during the first five months of the years 1864, 1865, 1866. With regard to sugar, it appears by the same returns that the increase in the imports for the five months ended 31st May last, as compared with the corresponding period of 1865, consists chiefly of the finer qualities. This is so far satisfactory as indicating that the alteration in the duties made two years ago was a step in the right direction, besides being a proof of the injurious influence the scale exercised on the quality of our imports; but the difference between the past and present state of things is purely one of detail, and the principle stands condemned notwithstanding that its evil effects have, to a certain extent, been mitigated. The decrease in exports of raw sugar is extremely large, the figures being, for the present year, 7,566 tons against 14,479 tons for the corresponding period of 1865; and the decrease in the deliveries for home consumption is even larger, the figures being 199,116 tons against 208,850 tons. As regards the stock of raw sugar in the United Kingdom, on the 31st of May last, a large increase is shown for every quality, with the exception of No. 1, or that equal to white clayed, which shows a small decrease as compared with 1865. The total increase for the present year in the stock amounts to 36,043 tons.

The Sponge Fishery of Rhodes.—The total number of boats employed in this fishery last year was 618, of which 35 fished at Bengazi, 156 at Mandruha, three at Syria, 157 at Caramania, 25 at Cyprus, 71 at Crete, the same number in the Ottoman Archipelago, and 100 off Greece. The total value of the take was 13,890,000 piastres. The boats were visited with unusual casualties, eleven were wrecked on the coast of Barbary during a gale of wind on the 28th August. About one-third more boats than usual went to Mandruha, where the fishing was plentiful. With the exception of three Symi boats, no other sponge fishing craft belonging to those islands remained on the coast of Syria, in consequence of a new tax of 18 per cent. custom dues and tithe, lately established on sponges fished in that locality. The boats which had sailed there proceeded to Caramania, which circumstance increased about one-third the number of those which originally intended to fish on that coast. Common and coarse sponges being principally imported to France, several sponge merchants of that country send annually agents to make their purchases direct from the divers, while not a single British merchant has as yet followed the same course for the purchase of fine sponges, which are chiefly forwarded to Great Britain. The higher prices paid by French merchants in consequence of competition are not only amply compensated by the difference between these prices and those of second-hand purchases, but, being themselves on the spot, they can make a choice of the qualities best suited for their markets, thus deriving more profits thereby. The average prices per oke (2¾lb.) ranged for fine sponges from 28s. 4d. to £2 15s., for common from 10s. to 26s. 8d., and for coarse from 4s. 2d. to 11s. 8d.

English Trade with Denmark.—The following is from Mr. Petre's consular report:—One of the natural consequences of the separation of the duchies from Denmark has been to divert the export trade in cattle and agricultural produce from its ancient channels, and to create an active direct export trade from the Jutland ports, Aarhuus and Aalborg, and at the same time to increase that branch of trade from Copenhagen, to Leith, Newcastle, Hull, and London. For the first time, direct and regular steam communication has been established between the ports of Jutland and Great Britain. Owing to the prolonged severity of the winter of 1864-65, the summer had set in before the steamers employed in this trade began to ply, but even this short experience augurs well for the future importance of this natural outlet for the rich agricultural and animal produce of Jutland and Fünen. Previous to the late war it was a common practice of the Jutland farmers to send their cattle, destined for exportation, to fatten in the duchies, and nearly the whole of the cattle exported to Great Britain were shipped at Tönning or at Hamburg. The Danish Government learnt with considerable satisfaction, from the British returns of imports and exports during the first three quarters of 1865, published by the Board of Trade, that the value of the Danish exports to Great Britain, during the nine months in question, not only exceeded the value of those exports for the corresponding period of 1864 by £382,486 sterling (an increase which the war might reasonably account for), but even exceeded by some few thousand pounds, the united value of the exports from the kingdom and the duchies together in 1863. These figures show conclusively, at all events as far as Great Britain is concerned, that Denmark has not suffered in the value of her export trade by the loss of the duchies. The ravages of the cattle plague in England and Scotland, from which Denmark has hitherto been spared, have doubtless given an exceptional impetus and value to her cattle trade. Scotland absorbs the greater part of the Danish exports to Great Britain. Taking the most important items, such as butter, bacon, flour, dried fish, and oilcake, the exports to Leith were in the aggregate three times greater than the whole of the exports to the three

English ports above-named. Of the 39,617 head of cattle, including sheep and pigs, exported, 26,754 went to Leith. With the exception of bran, wool, and alum, the returns show a considerable increase in all the exports as compared with the previous year, but the most notable increase was in the exports of butter and bacon; nearly 6,000,000 lbs. of the former, valued at £330,000 sterling, were sent to Great Britain in 1865, as against 4,000,000 lbs. in 1863, and of bacon and hams, 3,500,000 lbs., as against 1,500,000 lbs. There was an increase, too, of 500,000 lbs. of oil-cake over 1864, which is a considerable article of exportation, and goes chiefly to Leith. The number of cattle, sheep, and pigs, exported from Denmark to England and Scotland in 1864 was only 206; in 1865, as already stated, 39,617 were exported. The almost total cessation of the exportation of cattle in 1864 is assignable, of course, to the war. Three-fourths of the cattle exported to Great Britain went from Jutland, the great cattle-breeding province of the kingdom; whereas, nearly two-thirds of the sheep and pigs were exported from Copenhagen. In conclusion, it may fairly be said that a country of the now narrowed dimensions and reduced population of Denmark, which can send in one year to the British markets the amount of produce mentioned above, although it has suffered cruelly in many respects by the late war, is a country which still possesses the essential elements of vitality and of future material prosperity.

Colonies.

TRAMWAYS AT SYDNEY.—A select committee, appointed y the colonial parliament to inquire into the tramway in 'itt-street, Sydney, completed their inquiry shortly be- ore the end of last session, and it appears to be proved hat the tramway is of no practical use as a means f increasing the traffic of the Government rail- ays. At no time since its construction has it been sed for the removal of country produce of any kind, or erchandize, for the interior, nor does it appear to be garded as a great convenience to the general body of ilway passengers, though it is held in value on this count by the suburban residents on the line, who ily come into the city to attend to business. The ils, as at present laid down, are objected to as danger- is to ordinary carriages crossing over them. It is ad- itted, on the other hand, that the tramway has been much service to the Government in removing rail- y stock from the wharf and the railway station. e committee have stated that the rails will be finally ken up at the end of the present year.

REVENUE OF NEW SOUTH WALES.—A statement of consolidated revenue of this colony and of the cial funds paid into the treasury at Sydney during quarter ending 31st March, 1865, and the 31st March, 6, respectively, shows that the total revenue proper the quarter ending 31st March, 1866, amounted to 2,397 14s. 9d., against £333,216 15s. 8d., for the same rter of 1865, showing an increase of £129,180 19s. 1d. e heads of revenue showing an increase are:—Customs, ut £60,000; land revenue, £51,000; postage, £3,911; mission on money orders, £325; fees of office, £329; nps, £17,751; railway receipts, £1,003; telegraph ipts, £1,144; harbour dues, &c., £562; tonnage , £222. Those showing a decrease are duty on ed sugar and molasses, £2,353; spirits distilled in colony, £3,518; gold, £1,440; mint receipts, £1,499; ises, £1,257; fines, £111. In the customs revenue e is a decrease in the amount on duties collected on its, wine, tobacco, tea, sugar and molasses, and e and chicory, of £19,571, but there is an increase le, beer, and opium £2,054. The Murray River oms increase the customs revenue by £15,871, and the *ad valorem* and package duty by about £60,000. The new duty on hops, malt, rice, and dried fruits amounted to £2,508, and this makes the total increase £79,449, so that without these new taxes the customs would have shown a falling off of £17,500.

Publications Issued.

The MUSICAL STANDARD comes out this month as a weekly paper. It is believed that the subject of musical education, to which the attention of the committee appointed by the Council of the Society of Arts has been so long devoted, will frequently be treated in its columns.

Forthcoming Publications.

ILLUSTRATIONS OF THE MEDIÆVAL ANTIQUITIES IN THE COUNTY OF DURHAM, by J. Tavenor Perry, M.I.B.A., and Charles Henman, jun., architects, will shortly be published, on toned paper, super royal folio. It is proposed that this work shall contain a series of examples selected from the unrestored buildings of the county, measured and drawn to scale, and interspersed with such sketches as may be necessary to illustrate the subject. It is stated in the prospectus that all the drawings were prepared during the spring and summer of 1865, previous to the last congress of the British Archæological Association held in Durham. The plans, &c., of Finchale Priory were prepared for, and recently gained, the medal of the Royal Institute of British Architects; while the others were the result of a tour made by the first Pugin travelling student for the purpose of studying remains of mediæval art. The drawings will include specimens from the Cathedral and Castle, hitherto unpublished in this manner; portions of the churches of Auckland, Chester-le-street, Bolton, Ryton, Medomsley, &c., and complete illustrations of the Priory of S. Godrick Finchale, and S. Hilda, Hartlepool. There will be in all about fifty plates, accompanied by a short explanatory text. These will be issued to subscribers at the rate of £1 1s. a copy; or on large and superior paper, £1 11s. 6d. Only 250 copies will be published, after which the stones will be destroyed. Intending subscribers should apply to the authors, at 9, John-street, Adelphi.

Notes.

THE CENTRAL COTTAGE IMPROVEMENT SOCIETY.—The Council of the Central Cottage Improvement Society, whose exhibition of plans at the Society of Arts is attracting attention, have awarded the prizes for the best designs. The successful competitors were—First, Mr. J. F. Smith, Packington-street, Islington; second, Mr. Gregory Gill, Dukinfield, Cheshire; third, Mr. Habershon, jun., Norwood. Many excellent plans were excluded from the competition on the ground that they partook too much of the villa character; but the exhibition is on the whole excellent, and well worthy of a visit.

COMMUNICATION BETWEEN RAILWAY GUARDS AND PASSENGERS.—A system of electric communication, the invention of Mr. C. B. Walker, F.R.S., telegraphic engineer of the South-Eastern Railway, is now being tried on that line. It may be thus briefly described. In each department of the several carriages is a spring resembling in appearance a bell-pull. The pulling of this by a passenger inside the carriage causes a bell to ring in either of the breaks, and it is thus that an alarm is raised. At the instant the bell is pulled a round sign

springs open on the outside of the carriage, indicating the department in which the signal was given. To prevent false alarms, and in order to ascertain the person who pulled the bell, the pull on being drawn out disconnects itself with the apparatus and remains in the hand of the person who pulled it, it being impossible to replace it without a proper key. It being presumed that this is sufficient communication between passengers and guards, a telegraphic wire gives an equally easy communication between guard and guard and guard and engine-driver. An experimental train with this arrangement is to be run as a mail express train on this line of railway.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 4th July, 1866.*

201. Bills—Charitable Donations and Bequests (Ireland).
202. „ Public Health (as amended by Select Committee).
315. Finance Accounts—Parts I. to VII. (1865-6).
370. Constabulary (Ireland)—Statement.

Delivered on 5th July, 1866.

350. East India (Shan States, &c.)—Letter.
364. Malt and Beer—Return.
383. Civil List Pensions—List.

Public General Acts—Caps. 39 to 48.

Delivered on 6th July, 1866.

203. Bill—Writs Registration (Scotland) (as amended by Select Committee).
365. Excise and Customs (Ireland)—Statements.

Victoria (Australia)—Further Correspondence.

Delivered on 7th July, 1866.

205. Bills—Thames Navigation (as amended by the Select Committee).
206. „ Revising Barristers' Qualifications.
63. (VIII.) Committee of Selection—Ninth Report.
69. (VII.) Railway and Canal Bills—Eighth Report.
356. Fire Insurances—Account.
390. Rochdale Vicarage Bill—Minutes of Evidence.

Delivered on 9th July, 1866.

359. Peace Preservation (Ireland) Act—Return.
378. Anchors—Return.
382. Cattle Diseases Prevention Act (1866)—Complaint.

Patents.

From Commissioners of Patents' Journal, July 6th.

GRANTS OF PROVISIONAL PROTECTION.

Ammoniacal liquor—1615—G. D. Malam.
Anchors—1624—A. H. Linnington.
Animal charcoal, treating—1640—W. B. Patrick.
Animals, shearing—1645—A. D. Renshaw.
Animal substances, preserving—1707—H. Medlock and W. Bailey.
Bedsteads—1661—B. Browne.
Bricks—1712—W. H. Fyfe.
Candles—1626—L. A. de Milly.
Canisters—1684—W. Welbourne.
Carriages—1529—C. Brautigam.
Carriage wheels, preventing the accumulation of dirt on—1716—H. W. Hart.
Cast steel—1625—V. Gallet.
Churning—1614—E. Morris.
Combustible substances, burning—1594—T. J. Leigh.
Compound lenses—1641—J. H. Dallmeyer.
Conduits—814—A. A. Croll.
Dress, fastenings for articles of—1690—J., S.A., G.E., &F.F.Reading.
Excavating—1701—J. Milroy.
Excavating, scoops for—1483—W. Clark.
Fastenings—1500—C. Nurse.
Fibrous substances, combing—1708—J. Northend, J. Holmes, W. Hopkinson, and W. Bibby.
Fibrous substances, spinning, &c.—1687—E. G. Fitton.
Fire-arms, breech-loading—1622—W. E. Newton.
Fire-arms, breech-loading—1691—T. P. Saville.
Fluid compasses—1627—W. R. Hammersley.
Fluids, distilling volatile products from—1710—W. R. Lake.
Furnaces—1232—J. Thomas and A. Prince.
Grain, decorticating—1586—H. A. Dufrené.
Graining, tools for—1643—T. Chaloner and J. Billington.
Hoists—1618—W. Bellhouse.
Hydro-carbon oils, treating—1697—J. Young, jun.
Life boats—1659—W. Forgie and J. Thornton.
Liquid cargoes, ships used in conveying—1705—C. Beeching.
Liquids, registering the flow of—1696—A. Clayton.
Liquors, packing and transporting—1678—H. Gardner.
Locks—1635—A. Macdonald.
Locks or fastenings—1688—C. E. Brooman.
Materials, fixing colouring matters on—1642—A. Paraf.
Metal, cutting, &c.—1677—T. Dunn.
Metallic packing—1668—C. A. Dufour.
Metals, moulds for casting—1631—A. Lees and J. B. Slater.
Motive-power apparatus—1666—J. Parker.
Motive power, producing—1714—J. Jordan.
Nets—1619—J. B. Payne.
Nets—1634—W. M. Ward.
Permanent inflammable gases, treating—1628—B. F. Stevens.
Pigments—1639—J. E. T. Woods.
Pipes—1698—C. F. Cotterill.
Pistons and cylinders—1711—T. Kennedy, jun., and J. Barr.
Printing, preparing colouring matter for—1657—J. Meller.
Pulleys—1702—W. E. Gedge.
Pulp—1654—D. A. Fyfe.
Railway carriages, coupling—1686—E. G. Brewer.
Railways—1676—T. Deakin.
Railway signals and switches, working, &c.—1661—H. Hill.
Reaping and mowing machines—1621—J. Whitaker.
Retorts—1600—J. Nicholas.
Rotary and reciprocating engines—1647—T. Blatch.
Rotary engines—1669—G. Turton.
Rotary engines—1674—A. V. Newton.
Safes—1671—E. Peyton.
Salt cellars—1655—E. Bourdier.
Screw nuts and bolts—1644—F. B. Lucas.
Sewing machines—1653—A. Bourn.
Spirit meters—1692—W. E. Newton.
Steam boilers, preventing incrustation in—1720—H. F. Wesheim.
Steam gauges—1675—G. Davies.
Steam, generating—1694—E. Field and F. Wise.
Steam, generating—1709—W. Fairbank.
Substances, screening—1719—W. Wyatt.
Sugar—1623—W. Knaggs.
Surfaces, paving—1663—C. P. Henry.
Thermo-electric magnetic batteries and engines—1718—J. Baker.
Tobacco, finishing—1713—R. H. Clydesdale and J. E. Wilson.
Trimmings—1664—W. Smith.
Tubes, fittings for—1636—G. H. M. Muntz.
Vermin traps—1632—G. R. Wilson.
Vessels, propelling—1497—R. B. Boyman.
Vessels, propelling—1509—G. P. Evelyn.
Voltaic piles—1637—G. L. Leclanche.
Watches, exhibiting the time on dials of—1679—P. Barlow.
Weaving, looms for—1613—J. J. and E. Harrison.
Weaving, looms for—1685—E. Hemingway.
Weights, raising—1672—W. and W. T. Eades.
White lead—1703—W. R. Lake.
Windows, &c., securing—1616—J. Carter.
Wood screws—1689—C. E. Brooman.
Woven fabrics, printing on—1704—St. C. Raddison.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Metal boxes, tins, or cases—1722—W. E. Gedge.
Safety locks—1750—H. A. Bonneville.
Submarine telegraph cables—1749—H. A. Bonneville.
Subterranean telegraph wires—1751—H. A. Bonneville.

From Commissioners of Patents' Journal, July 10th.

PATENTS SEALED.

63. T. Bradford.	106. P. L. Charon.
78. J. Ireland and S. Davies.	108. J. M. Napier.
82. J. Clutton.	109. R. T. Sutton.
84. A. S. Brooman.	111. W. Comery and H. Webster.
85. A. S. Brooman.	112. H. A. Dufrené.
90. H. Dean.	118. W. Gadd and J. Moore.
92. T. A. Blakely & J. Vavasseur.	121. B. Todd.
93. J. C. Angus and G. Stuart.	123. H. Gottheimer.
95. R. Mathers.	139. C. Moriarty.
97. C. Crump.	171. F. Cole.
100. F. J. King.	197. S. F. Allen.
104. A. H. Hart.	886. S. Barbour.
105. W. B. Woodbury & G. Davies.	953. B. C. Prentice.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1646. R. A. Brooman.	1681. C. Schiele.
1720. A. R. Johnston.	1692. G. Haseltine.
1693. W. Basford.	1709. R. A. Brooman.
1687. W. E. Gedge.	1728. W. Henderson.
1726. R. Hornsby, jun., J. Bonnall, and W. Astbury.	1782. H. Elliott.
1761. R. Hornsby, jun., and J. E. Phillips.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1639. H. Brinsmead & J. Lawrence.	1627. D. Mathews.
1629. W. H. Harfield.	1631. J. Taylor.
1726. W. H. Harfield.	1654. T. Wright.

Journal of the Society of Arts.

FRIDAY, JULY 20, 1866.

Announcements by the Council.

Musical Education.

The Council met on Wednesday, the 18th inst., and took into consideration the report of the Musical Education Committee, published in the last number of the *Journal*.

Examinations, 1867.

The Programme of Examinations for next year is in preparation, and will shortly be ready for issue.

International Horticultural Exhibition and Botanical Congress.—Prizes for Implements.

It will be remembered that the Council of the Society of Arts, wishing to aid this undertaking, consented to offer prizes (amounting to £50) for subjects exhibited in Section IX., under Classes 231 and 232.

The following is the list of prizes offered, and of the awards made:—

Class 231.

(A.)—Half-size model, showing the best principle of construction for a tent for horticultural exhibitions, capable of being extended by a multiplication of the parts exhibited. A prize of £10. No award.

(B.)—The best transplanting machine for weights of eight tons and upwards. A prize of £10.—No award.

(C.)—The best transplanting machine for half-ton weights and upwards to two tons. A prize of £5.—Prize awarded to Mr. McIndoe.

(D.)—The best method of ventilating plant structures, to be shown by a model. A prize of £5.—Prize awarded to Messrs. Sanders, Frewen, and Co.

(E.)—The best garden wheelbarrow in principle of construction. A prize of £3.—No award.

(F.)—The best sunshade for garden seats. A prize of £3.—Prize awarded to Mr. T. L. Scowan.

(G.)—The best guard for protecting young trees from animals in parks, orchards, and pleasure-grounds. A prize of £3.—Prize awarded to Mr. W. Early.

(H.)—The best instruments for working to levels and slopes in garden-ground work. A prize of £2. —No award.

Class 232.

(A.)—Earthenware boxes for edgings, capable of producing any length of straight and curved lines for borders in conservatories. A prize of £3.— No award.

(B.)—Ornamental flower pots of large dimensions, of common red clay, for specimen plants, and for terraces. 1st prize, £3; 2nd prize, £2; 3rd prize, £1.—No award.

Proceedings of Institutions.

Burnley Mechanics' Institution.—The report for the year 1865 is presented under much more favourable circumstances than was that for the year 1864. At the close of 1864, and during several months of the year 1865, a large proportion of the operatives of the town were dependent on charitable aid, while an equal if not a greater number were supported by the relief afforded by the Poor-law Guardians. The improved condition of the operatives has already favourably affected the Institution, more especially in the number of entries to the evening classes; the numbers at the close of the year on the register being—males, 182; females, 85—total, 267. The numbers in the corresponding period of 1864 were—males, 150; females, 66—total, 216, showing an aggregate increase of 51. At the commencement of 1865, class attendance was comparatively low, but the results of the local and national examinations for the year prove the diligence and progress of the scholars to have been commendable. The following were the awards to the candidates from this Institution in 1865:—By the East Lancashire Union fourteen prizes, ranging in value from 5s. to 30s., and seven certificates. By the Lancashire and Cheshire Union, two prizes, value of £1 each, and ten certificates. By the Department of Science and Art, three first-class Queen's prizes, one of them being accompanied with the Gold Medal of the Department; three second-class Queen's prizes, four third class, and seven fourth class; also eight candidates passed with credit. By the Society of Arts, two prizes of £5 and one of twenty-five guineas; four first-class certificates, nine second, and six third. The distinguished success of one of the candidates, Thomas Healey, demands separate and especial notice. To him the Department of Science and Art awarded, for Elementary Mathematics, a first-class Queen's prize, with Gold Medal, which is given by the Department for special excellence only. The Society of Arts awarded to him (in 1865 and in preceding years) several first-class certificates and prizes, and the Prince Consort's prize of twenty-five guineas. In the early part of the year a series of "Penny Readings," combined with vocal and instrumental music, was given in the Assembly-room with great spirit and ability, chiefly by members of the Institution. These entertainments attracted large and approving audiences, and while they afforded inexpensive and intellectual amusement to the members of the Institution and the public, they uniformly yielded a balance in favour of the funds of the Institution. The acknowledgments of the directors are eminently due to the ladies of Burnley and the neighbourhood, for their liberal donations at the *soirée*. These donations, amounting to £101 13s. 3d., have materially improved the financial statement. To their repeated contributions the Institution is greatly indebted for its present position and efficiency. The statement of receipts and expenditure for the year shows the total income to be £702 5s. 1½d., and that a balance of £19 6s. 4½d. is due to the treasurer, being considerably less than in the former year.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 567).

CONIC SECTIONS.

THREE HOURS ALLOWED.

Section I.—Geometrical Conics.

1. What is a cone? Show that a section of a cone made by a plane which cuts both slant sides is a *symmetrical* curve.

2. Prove that the tangent to a conic, measured from the point of contact to the directrix, subtends a right angle at the focus.

3. Draw a pair of tangents to a parabola from a point without it.

4. If SY is the perpendicular from S, the focus of a parabola, on the tangent at P, prove that—

(1.) Y is on the tangent at the vertex.

(2.) $SY^2 = SA \times SP$.

5. Define an ellipse, its centre, foci, vertices. If the major and minor axes of an ellipse are given, how can the ellipse be described by continuous motion, and what will be its area?

6. Prove that in the ellipse $CN \times CT = CA^2$, where C is the centre, and T is the point in which the tangent at P meets the major axis, NP being the ordinate. What is the corresponding property of the parabola?

7. What are conjugate points on an ellipse? If P and D are conjugate points, show that $SP \times PH = CD^2$: $CP^2 + CD^2 = CA^2 + CB^2$.

8. Prove that the tangent at any point of a hyperbola bisects the angle between the focal distances.

9. Prove, by the method of projections or otherwise, that the hyperbola has asymptotes.

10. If the chord Qq of a hyperbola meets the asymptotes in R and r, prove that $QR = qr$. Hence prove that the area of a triangle contained between the asymptotes of a hyperbola and a tangent is constant.

11. Prove that all conics may be projected into circles. Hence prove Pascal's theorem.

Section II.—Analytical Conics.

12. Determine the relation between the constants when $y = mx + c$ is perpendicular to $y = nx + b$. Find the length of the perpendicular from (x_1, y_1) on $ax + by + c = 0$.

13. What is the area of the triangle contained between the three lines $y = mx, y = nx, ax + by + c = 0$? Show that the result expresses space in two dimensions.

14. Find the centre and radius of the circle whose equation is

$$x^2 + y^2 - 4x + 6y - 3 = 0.$$

What are the equations to the tangents which are equally inclined to the co-ordinate axes?

15. If the base and vertical angle of a triangle are given, prove that the locus of the vertex is a circle.

16. Prove analytically the theorems contained in 4, 6, 7, 10 of the preceding section.

17. Find the polar equation of the ellipse, when the focus is the pole. What does the equation become when $e = 1$?

18. Prove that the locus of the middle points of a system of parallel chords of a parabola is a straight line parallel to the principal diameter of the curve.

NAVIGATION AND NAUTICAL ASTRONOMY.

THREE HOURS ALLOWED.

Section I.

1. The arc joining the poles of two great circles subtends an angle at the centre equal to their inclination; and the point of intersection of the great circles is the pole of the great circle in which the poles lie.

2. The area of a spherical triangle is the same fraction of the area of a hemisphere that the excess of sum of its three angles above two right angles is of 360°.

3. In any spherical triangle prove the formula:—

$$\text{Cot. } a \text{ Sin. } b = \text{Cot. A Sin. C} + \text{Cos. } b \text{ Cos. C}.$$

Section II.

1. Prove the formulæ:—

$$\text{Tan. } \tfrac{1}{2}(a + b) = \frac{\text{Cos. } \frac{1}{2}(A - B)}{\text{Cos. } \frac{1}{2}(A + B)} \text{ Tan. } \tfrac{1}{2} c.$$

$$\text{Tan. } \tfrac{1}{2}(a - b) = \frac{\text{Sin. } \frac{1}{2}(A - B)}{\text{Sin. } \frac{1}{2}(A + B)} \text{ Tan. } \tfrac{1}{2} c.$$

2. One angle of a triangle is a right angle. Write down the equations which connect the other angles and the sides, and prove them.

3. Having given the three angles of a spherical triangle, find the sides.

Section III.

1. Find the compass course and distance from A to B, having given—

Lat. A 35° 18′ N. Variation 2 pts. E. Long. A 85° 18′ W.
„ B 35° 18′ N. Deviation 8° 50′ E. „ B 43° 22′ W.

2. On June 23rd, at noon, a point of land in lat. 45° 27′ N., long. 15° 35′ W., bears by compass N.N.W., variation $1\frac{3}{4}$ pt. E., deviation 8° 15′ W., distant 15 miles; afterwards sailed by compass during the next 24 hours as follows:—

K.	10ths.	Courses.	Wind.	Leeway.	Deviation.
79	8	ENE	EbS	$1\frac{1}{4}$	8° 15′ E
58	5	SbW	ESE	1	9° 12′ W
75	7	NNE$\frac{1}{2}$E	WNW	$1\frac{3}{4}$	8° 30′ E

Required the latitude and longitude in on June 24th at noon.

3. Required the distance on a great circle from A to B given.

Lat. A 18° 15′ N Long. A 33° 12′ W.
„ B 58° 21′ N „ B 75° 18′ W.

Section IV.

1. Feb. 11th, 1866, in long. 100° 15′ W, the observed meridian altitude of the sun's lower limb was 36° 25′ 10″ (zenith N of the sun) index error + 3′ 15″ and the height of the eye above the sea was 12 feet. Required the latitude.

2. June 9th, a.m. in lat. 10° S, long. 31° 30′ E, when a chronometer showed 7h. 33′ 35″ (it being June 9th, a.m. at Greenwich) the observed alt. sun's L.L. was 42° 35′ 10″. Index error + 1′ 50″ and the height of the eye above the sea 19 feet. Required the longitude.

On May 8th at noon, the chronometer was too fast on G. M. time 36′ 10·5″, and its daily rate was 2·5″ losing.

Section V.

1. Define *course*, *distance*, *rhumb-line*, and *departure*, and illustrate by a diagram.

2. Prove that distance = departure × cosec. course.

3. Prove the rule for finding the meridional parts for a given latitude.

Section VI.

1. Obtain an expression for computing the altitude of a given celestial body for a given time.

2. Prove the rule for finding the latitude by altitudes of any celestial object observed near the meridian.

3. Prove a rule for clearing a lunar distance of the effects of refraction and parallax.

Section. VII.

Describe the sextant, and prove the rule for graduating it.

Section VIII.

1. December 4th, at 8h 10m a.m., latitude 50° 15′ N., long. 160° 45′ E., the sun rose by compass S. 61° 15′ E., the ship's head being N., deviation 2° 45′ E., when the observed altitude of sun's L.L. was 7° 10′ 40″. The index error + 2′ 10″, and the height of the eye 17ft. Required the variation.

2. September 23rd, in lat. 47° 58′ N., long. 67° E., the following double altitudes were observed:—

Mean time nearly.	Chronometer.	Obs.alt. Sun's L.L.	True bearing.
9h. 30m. a.m.	9h. 31′ 40″	36° 20′ 40″	S.E.b.E.
1h. 40m. p.m.	1h. 41′ 30″	30° 15′ 20″	S.W.b.W.

The run of the ship in the interval was S.b.W. 18 miles, the index error was + 3′ 40″, and the height of the eye was 20 feet. Required the latitude at the time of taking the second observation.

PRINCIPLES OF MECHANICS.

THREE HOURS ALLOWED.

1. How are forces geometrically represented? State some cases in which forces acting on a particle evidently balance one another.

2. Into how many classes, and according to what distinctions, are levers usually divided? Give examples of each class. Prove that in the most general case the moments of the forces which balance one another on a lever about the fulcrum are equal.

Ex. Two weights of 3 lbs. and 7 lbs. respectively hang from the extremities of a lever one yard long; find the fulcrum, (1) on the supposition of the lever being weightless; (2) on the supposition of its weighing 10 lbs.

A body placed in one scale of a false balance appears to weigh 9 lbs., when placed in the other to weigh 16 lbs. What is its true weight?

3. Show that every system of particles and every body of matter has one and only one centre of gravity. How would you practically find it in each of the cases?

A straight wire 5 feet long is composed of two pieces of 3 feet and 2 feet in length respectively. The former is composed of matter which weighs 1 oz. per foot, and the second of matter which weighs $3\frac{1}{2}$ oz. per yard. Find the centre of gravity of the whole wire.

4. What is meant by the principle of virtual velocities? Prove that it exists in the case of the screw.

5. State the experimental laws of statical and dynamical friction. Prove that the coefficient of friction is equal to the tangent of the limiting angle of resistance.

6. What is meant by the expression "Accumulated work?"

Required the work accumulated in a ball whose weight is 5 lbs., and whose velocity is 10 feet per second.

7. Prove that if, the ordinary units being chosen, U express the work accumulated in a body, V its velocity, W its weight, g the accelerating force of gravity,

$$U = \frac{V^2 \times W}{2g}$$

A train weighing 60 tons has a velocity of 40 miles per hour when the steam is turned off, how far will it ascend an incline of 1 in 100, taking the friction at 8 lbs. per ton?

8. What is meant by the centre of gyration? Investigate its position in a plane ring like the rim of a fly-wheel.

The weight of a fly-wheel is 13 cwts. The internal and external diameters of the ring are 9 and 10 feet. Find the centre of gyration. The wheel makes 30 revolutions per minute. The diameter of the axis is 3 inches, and the friction upon it one-seventh of the whole weight. How many revolutions will the wheel make before it stops?

9. Describe the common wheel barometer. What are its *peculiar* defects? What are those which it shares with the common barometer? How are they remedied in the best instruments?

Why does a barometer fall in unsettled weather?

10. Explain the action of the syphon. For what purposes is it commonly used? Explain by it the cause of intermittent springs.

11. A sloping embankment is subjected to the pressure of water. Supposing it to be of the form of a rectangle, investigate (1) the amount of pressure; (2) the point where the resultant acts.

Required the pressure on the staves of a cylindrical barrel filled with water, the diameter of the base being 3 feet and the height 4 feet.

12. Describe a fire-engine.

The section of the pipe of a fire-engine is 1 sq. inch, and the velocity of the water discharged is 50 feet per second. Required the horse-power necessary to work the engine.

13. What is the distinction between a simple and a compound pendulum? Prove that in the latter the centres of suspension and oscillation are reciprocal.

Determine the distance between them in a body that vibrates in 3 seconds.

14. Supposing the annual fall of rain over the whole earth to be 4 feet in depth, and to have descended from the height of half a mile, what is the work of the sun by evaporation in the course of a year, estimated in horse-powers?

PRACTICAL MECHANICS.

THREE HOURS ALLOWED.

1. Upon what principle are the teeth of a pair of wheels arranged, when the wheels are required to communicate motion between two shafts, whose directions meet at right angles in a point, and one of which is to rotate faster than the other in the proportion of three to two?

2. Define a *screw surface*, and the *pitch* of a screw. What are the forms of screw thread usually employed, and how do they differ in their mechanical properties?

3. Explain the contrivance known as the *eccentric*, and show that it is a mechanical equivalent for the crank and connecting rod.

4. Describe some form of quick return movement suitable for actuating the table in a planing machine.

5. Explain the method of arranging change wheels in a screw cutting lathe, and select some numerical example to show how a screw of a required pitch may be cut in a given lathe.

6. In a train of three wheels in gear, whereof the first is fixed, and the other two are attached to an arm, which is capable of revolving about the centre of the first wheel, upon what principle can you arrange that the third wheel shall be carried round upon the arm without rotating at all upon its own axis? Hence show how a wire sheathing may be laid upon a rope without any twist being given to the wires.

7. What is the action of the fusee of a spring clock?

8. Explain the different modes in which the steam acts in the atmospheric, condensing, and high pressure steam-engines, pointing out the great improvement introduced by Watt.

9. Describe some form of steam slide-valve, and explain its action.

10. Why is it economical to work steam expansively?

11. Explain the principle upon which a locomotive boiler is constructed.

12. Why did the introduction of the screw propeller render a modification of the marine steam-engine necessary? Describe the general arrangement of a trunk engine, and the form of a screw propeller.

(To be continued.)

MUSIC IN ENGLAND.

Brief Notes on Music in England from the Time of the Anglo-Saxons to the Commencement of the 18th Century, and the Aid Afforded by the Crown, &c., to its Support.

As far as can be ascertained from the authorities which have been consulted, the condition of music in England at the period from the 7th to the end of the 15th century is obscure.

The ancient Bards are intimately connected with the early history of poetry and music. The Scald of the Runic mythology, and the Minstrel of the baronial castle, are only varieties of the same genus. Bards may be said to be almost indigenous to the principality of Wales, and the bardic institutions of the Irish bear a strong affinity to those of the Welsh.

Cadwaladyr, the last king of Britain, is supposed to have first regulated the minstrelsy of the bards. He died at Rome about 590. According to Wotton, the bards were divided into three classes, and fixed stipends were attached to each. The first class were makers or poets; the second were the players on the harp; and the third, or lowest order, accompanied the music of others by their voices. However inferior to the two former ranks, their science was not inconsiderable. They tuned and understood the harp; they were conversant with the twenty-four measures of instrumental music and the

twenty-four modes of metrical composition. At a royal wedding their post was to wait on the bride. Every three years a solemn assembly (Eisteddvod) of princes and chieftains was held, and degrees of rank were conferred on those bards who distinguished themselves in the contest of the Muses. The chief bard was in rank the eighth officer of the king's household, receiving from the hand of the monarch a harp, from which he promised never to part. His land was held free, and he had many other privileges. No Eisteddvod has been held by royal commission since the 9th year of Queen Elizabeth's reign (1567). This commission is said to exist, and to be in the possession of the Mostyn family. (Encyclop. Metrop. art. *Bard.*)

The author of "Music and the Anglo-Saxons" (Francis D. Wackerbarth) says, p. 46, "The Anglo-Saxons, previous to their arrival in England, possessed an epic poem (Beowulf), and from it may be learned that music was a great amusement of our ancestors, and constantly called in to aid the festival and banquet. Bede, in his account of the poet Ceadmon, infers that the Anglo-Saxon youth were accomplished in music. Music formed one of the four divisions of education at this period, and Bede and Alcwine wrote treatises on it. 'Music,' says the venerable presbyter, 'is the most worthy, courteous, pleasant, joyous, and lovely of all knowledge; it makes a man gentlemanly in his demeanour, pleasant, courteous, joyous, and lovely. ......It refreshes the troubled spirit, removes sorrow and headache (*dolorem capitis*), expels foul spirits, and cures crossness and melancholy.'" (Vol. i., 353.)

The instruments then in use, according to Bede, were the organ, viol, harp, atola (?), psaltery (a kind of harp-lute), drum, and cymbals.

"The organ," says Bede, quoting from Cassiodorus, who died in the sixth century, "is, as it were, a tower built up of many pipes, from which by the blast of bellows a most copious sound is obtained; and that the same may be composed of fit melody, it is furnished on the inside with wooden tongues, which, being skilfully depressed by the master's fingers, produce grand and very sweet music." The organs of the Anglo-Saxons seem to have much resembled those of modern times, even in external decoration. At the beginning of the eighth century (A.D. 709) the pipes were gilded. (Aldhelm. De laude Virginum, tom. xiii., p. 3.) The metal employed was generally copper. Mr. Sharon Turner, in his "History of the Anglo-Saxons," vol. 3, p. 458, quoting Gale ("Historia Rameniensis," tom. iii., p. 420), says that "The Earl (Dunstan) devoted thirty pounds to making copper pipes of organs, which resting with their openings in thick order on the spiral winding in the inside," &c.

William of Malmesbury, who wrote about the year 1120, says that the Saxons had organs in their churches before the Conquest; and also records that Dunstan, in the reign of King Edgar, gave an organ to the Abbey of Malmesbury.

The harp was the common musical instrument of the Anglo-Saxons. The Welsh, or Cambro-Britons, called their harp *teylin*, a word of uncertain etymology. In the Erse its name is *crwth*.

"The harp was the favourite musical instrument of the Britons and other northern nations in the middle ages, as is evident from their laws and various passages in their history. By the laws of Wales, a harp was one of the three things that was necessary to constitute a gentleman or a freeman; and none could pretend to that character who had not one of these instruments, or who could not play upon it. To prevent slaves from pretending to be gentlemen, it was expressly forbidden to touch or to permit them to play upon the harp; and none but the king, the king's musicians, and gentlemen, were allowed to have harps in their possession. A gentleman's harp was not liable to be seized for debt, because the want of it would have degraded him from his rank, and reduced him to that of a slave. The harp was in no less estimation and universal use among the Saxons and Danes." ("Essay on the Ancient Minstrelsy in England," by W. Chappell.)

The Anglo-Saxons seem to have had varieties of the small harp. Some of these, according to Bede (vol. viii., p. 311), were stricken with the fingers, others with the plectrum or quill.

"The cymbals (*cymbala*) are small vessels, composed of mixed metal, which when stricken together on the concave side in skilful time, produce, by their delightful collision, a very sharp note."

The tradition that Alfred the Great paid a visit to the Danish camp disguised as a harper should be noted, if not as a historical fact, still as an illustrative myth.

In the "Archæologia" (vol. ii., p. 100, &c.) there is a paper entitled, "Observations on Dr. Percy's Account of the Minstrels among the Saxons," by Mr. Pegge. These critical observations are adverse to what Dr. Percy says in his essay on the ancient English minstrels, touching their state and condition in Saxon times; and that King Alfred (A.D. 878) in his visit to the Danish camp, did not disguise himself as a bard or minstrel, but rather as a mimic, jester, or jack-pudding. Spelman, in his "Life of Alfred" (p. 199), says, "that he (Ælfred) provided himself of musicians, not common or such as knew but the practick part, but men skilful in the art itself, whose skill and service yet further improved with his own instruction, and so ordered the manner of their service, as best testified the royalty of the king." Mr. Sharon Turner (vol i., p. 558) says, "His (Alfred the Great's) early predilection for the Saxon poetry and music, had qualified him to assume the character of an harper; and thus disguised, he went to the Danish tents. His harp and singing excited notice, &c."

"This excellent prince," says Burney, "not only encouraged and countenanced the *practice* of music, but in 886, according to the annals of the church of Winchester, and many ancient writers, founded a professorship at Oxford for the cultivation of it as a *science;* and the first who filled the chair was Friar John of St. David's, who not only read lectures upon music, but logic and arithmetic."

Church Music.

In 669, Theodore and Adrian, who planted learning among the Anglo-Saxons, also introduced into Kent the ecclesiastical chanting, which Gregory the Great had much improved. From Kent it was carried into the other English churches. In 678, one John came also from Rome and taught in his monastery the Roman mode of singing, and was directed by the Pope to diffuse it amongst the rest of the clergy, and left written directions to perpetuate it. Under his auspices it became a popular study in the Saxon monasteries. (See Bede, iv., 2, 18, and v. 22.)

Doctor Burney states (vol. 2, p. 24) that from the time of St. Gregory to that of Guido, there was very little distribution of keys, "nor were any semi-tones used but those from E to F, B to C, and occasionally A to B flat; and that there was no uniformity of chanting ordained till the time of St. Gregory, though there was a very early distinction between the manner of singing the hymns and chanting the psalms. St. Athanasius and Geronticus, a monk of Alexandria, and many of the fathers of the fourth century, have left testimonies and admonitions concerning this distinction." And in a note adds, "that it seems the chief distinction was, that the hymns were frequently sung by single persons, and the psalms generally chanted in a chorus of the whole congregation."

The union of music and dancing may be traced to the first oratorios or sacred dramas, which were first performed in churches. In "Hume's History of Great Britain" (vol. I., p. 200) is an account of the ceremonies used by Archbishop Laud in the consecration of St. Catherine's Church, in which the action of that prelate before the high altar is considered by Burney to amount to dancing, Laud being very desirous of reviving the religious observances of the Roman Catholics.

The word "Choir," meaning that part of a cathedral

church where the canons and priests perform the ritual ceremonies of religion, is curiously derived from χορος, a dance or company of dancers. "Chorus" has the same derivation, and signifies a company of singers in a church, that is, a choir. According to the authority of the venerable Bede, and also of William of Malmesbury, Pope Gregory the Great sent Austin the monk from Rome to convert the Saxons, and instruct them in ecclesiastical music (A.D. 596); and Bede says, that when the monk and those of his mission had their first audience of King Ethelbert, in the Isle of Thanet, they approached him in procession, singing litanies, &c. This was probably the first time the Anglo-Saxons heard the Gregorian chant.

Mabillon states (Annal. Benedict, vol. iv.), letters were used for notes "in canto fermo" before the ninth century. Agobard, Archbishop of Lyons, collected into one book all the several chants, as they were sung throughout the year in his own church, under the title of "Antiphonarium." This would imply a notation in common use at that time, at least in France, but whether the letters of the Roman alphabet, which St. Gregory is supposed to have first adopted, instead of the endless perplexities of the Greek method, is uncertain. In the MS. of the "Micrologus" of Guido, written two centuries later, alphabetic notes are used, but explained by Gregorian notes. (Burney, vol. 2, p. 32.)

MINSTRELS AND MINSTRELSY.

Minstrels and minstrelsy are closely connected with the early history and progress of music in England. An immense deal has been written and printed about minstrels, but there is much uncertainty as to their origin, and great controversy among the authorities as to their early status and proceedings. Even the word "minstrel" is interpreted to mean various callings other than those of music. By some authors it is asserted that the founder of the ancient Priory of St. Bartholomew the Great, near Smithfield, was a minstrel. His name was Rahere or Raherus. In the "Essay on the Ancient Minstrelsy in England," by William Chappell, it is so stated. But the only ground for this supposition seems to be that previous to Rahere becoming a monk he had belonged to the court, was constantly near the King's person, was of a gay disposition, and addicted to folly and dissipation. Some considerable time after his death the monks of the priory wrote legendary chronicles of his early life and history, in which they set forth his vices in great contrast to his after holiness. (See Dugdale's "Monasticon Anglicanum.")

The county palatine of Chester seems to have been, from a very early period, famous for minstrels, more so than any other part of England.

In a general history of music, by Sir John Hawkins, there are copious accounts of the ancient minstrels, particularly those of Cheshire; and in Lyson's "Magna Britannia" (vol. iii., p. 523), will be found also a long and similar account.

In the "Essay on Ancient Minstrelsy in England," by Mr. Chappell, before quoted, at page 8, occurs the following:—"In the reign of Henry II., in the year 1180, a harper named Galfrid or Jeffrey (*Galfridus Citharœdus*), received an annuity from the Abbey of Hide, near Winchester" (Madox—"History of the Exchequer," p. 251). In the reign of Henry III. forty shillings and a pipe of wine were given to Richard, harper to the King, as also one pipe of wine to Beatrice his wife (Chappell, p. 8).

Giraldus Cambrensis, who flourished in the 12th century, says that the Angles, beyond the Humber, and in the neighbourhood of York, sing in symphonious harmony, &c. By long usage this custom is, as it were, converted into their nature. (Descriptio Cambriæ, cap. xiii.)

In Exeter Cathedral there is a minstrels' gallery, on the front of which are sculptured twelve figures of angels playing on various instruments. The instruments represented are the lute, bagpipe, clarion, rebec, psaltery, cittern, sackbut, regals, gittern, shalm, timbrel, and cymbals. The date is probably the early part of Edward the Third's reign, A.D. 1330. Britton says, in his history of the Cathedral, and in reference to this gallery, "We may presume that a band of musicians was stationed here on extraordinary occasions of sacerdotal pomp and minstrelsy. The design and character of the sculpture, and the forms of the different instruments, may be referred to Edward the Third's reign." A cast of this singular and rare example of ancient art may be seen in the South Kensington Museum.

The following extract is from the Harleian MS., No. 782:—

Household Book of Edward III., from the 18th to the 21st year of his reign.

Mynstrelles	25
Trompettes	5
Citolers	1
Pipers	5
Taberett	1
Clarions	2
Makerers	1
Waytes	3

Rates of wages in tyme of warre by the daie:—

Mynstrelles, every man by the daye......... 12d.

Anno 21 Edward III., in tyme of peace:—

Mynstrelles { 19, every man by yere......... 20s.
3 waytes, every man by yere 20s.

In the *Archæologia*, vol. xx., there is an article on the translation of a French Metrical History of the deposition of King Richard the Second (1399), a manuscript preserved in the British Museum, and in a footnote at page 22 is the following:—"The popular notion of a minstrel is attached, perhaps, too exclusively to the harp and the banquet. A minstrel was a performer on any instrument then in use, of wind or string. (Du Cange, *Gloss.*) It seems that upon some occasions they formed part of the military band. They are often spoken of . . . . in connexion with the trumpets (Froissart). Edward the Third took them to sea with him when he went to fight the Spaniards (Froissart)."

And in the same article, page 155,—"It (the Duke of Lancaster's host) was marvellously great, and showed such joy and satisfaction that the sound and bruit of their instruments, horns, buisines (a wind instrument made of metal—'*Ces buisines d'arein resonent*'), and trumpets were heard, &c."

In Rymer's "*Fœdera*," vol. vii., p. 555, is the following:—

A.D. 1387, 10 RICHARD II.

DE CONDUCTU PRO REGE MINISTRALLORUM.

Writ of safe conduct for Johannes Caumz, *Rex Ministrallorum nostrorum* qui versus diversas partes transmarinas transire proponit, &c. In cujus, &c., per unum annum duraturas. Dated at Westminster, 2nd May.

"*Fœdera*" (HOLMES), *tom.* 4, *part* 2, *p.* 126.

3 HENRY V., A.D. 1415.

PRO MINISTRALLIS.

A writ of indenture, dated 5th June, the 3rd year of the reign of Henry 5th, witnessing that "John Clyff, Ministral et autres xvij Ministralls ont resceeuz de nostre dit seigneur le Roy, par le mayns de Thomas Count d'Arundell and de Surrie Tresorer d'Engleterre, xl. l. s. sur lour gages, a chacun de ceux xij d. le jour pur demy Quarter de l'an." All which is "pleinement appuert."

"*Fœdera*," *Vol. X.*, *p.* 287. *A.D.* 1423, 1 *Hen. VI.*

PRO MINISTRALLIS REGIS.

Letters Patent, dated at Westminster 14 May, granting to *Willielmus Langton*, one of the late King's minstrels, 100 shillings annually, to be paid out of the Exchequer in two equal portions, at Michaelmas and Easter. Similar

letters patent, under the same date, granting to ten persons, named Marsham, Snathe, Haliday, Halyday, Pannell, Payte, Bradstrete, Chatterton, and Wilde, minstrels of the late King, 100 shillings a year to be paid out of the Exchequer, &c.

In Burney's *General History of Music*, vol. 2, p. 428, occurs the following:—"In the annual account roll of the Augustine Priory of Bicester, in Oxfordshire, for the year 1431, entries are made of the sums expended in fees to minstrels: "Given to the harper on St. Jerome's day, viii d. To another, called Hendy, at the feast of St. Simon and St. Jude, xij d. To the minstrels of Lord Strange, on Twelfth-day, xx d. To two of Lord Lovell's minstrells, after St. Mark's day, xvj d. To the minstrels of the Duke of Gloucester, on the feast of the Blessed Virgin, iij s. iiij d."

And in a foot note on the same page, Burney says he is indebted to the Rev. Thomas Warton ("History of English Poetry," vol. i., p. 91,) for the following:—"In the ancient annual rolls of accounts of Winchester College, there are many articles of the same sort, that is, entries of payments to minstrels, chiefly in the reign of Edward the Fourth."

"*Fœdera*," *Vol. XI.*, *p.* 510. *A.D.* 1463, 3 *Edw. IV.*

Pro Doctore Musicæ.

Letters patent, dated at Pontefract, 12 December, 1463, appointing Thomas Saintviste, *Doctor of Music*, Master of "the Kynges Halle," Cambridge, during his life, &c.

Anthony Wood (Hist. Acad. Oxon. lib. 1, p. 245) says that the degree of Doctor in the Faculty of Music was first given in the reign of Henry the Second. "But," says Burney (vol. ii., p. 401-2), "this is fixing it at an earlier period than that in which such a title can be proved to have subsisted at Oxford or Cambridge, or to have been conferred on the professors of other sciences. Spelman, a more nice and accurate sifter of facts, believes that the appellation of Doctor (of music) was not among the degrees granted to graduates in England till the reign of King John, about 1207. It is known that this title was created on the continent about the middle of the 12th century, as more honourable than that of master, which was become too common. Its original signification implied not only learning and skill, but abilities to teach, according to the opinion of Aristotle, who says that the most certain proof of knowledge in any science is the being able to instruct others."

According to Burney, the first degree of this kind which was conferred in a public school or academy, was at Bologna, about the year 1130, where, according to Bayle (Dict. Art. *Irnerius*), it was an honour instituted in favour of Irnerius, chancellor to the Emperor Lotharius, who was created Doctor of Civil Law. During the middle ages music was always ranked among the seven liberal arts; it was included in the *Trivium* and *Quadrivium*, and studied by all those who aspired at reputation for learning throughout Europe. The *Trivium* comprised the three sciences of grammar, rhetoric, and logic, which teach us how to reason with accuracy and precision; and the *Quadrivium* comprehended arithmetic, music, geometry, and astronomy, as the four branches of the mathematics which silently contemplate whatever is capable of being numbered or measured.

By the statutes of the University of Oxford it is required of every proceeder to the degree of Bachelor in Music, that he employ seven years in the study or practice of that faculty, and at the end of that term produce a testimonial of his having so done, under the hands of credible witnesses; and that previous to the supplication of his grace towards this degree, he compose a song of five parts, and perform the same publicly in the music-school, with vocal and instrumental music, first causing to be affixed on each of the doors of the great gate of the schools a programme, giving three days' notice of the day and hour of each performance. Of a bachelor proceeding to the degree of Doctor, it is required that he shall study five years after the taking his bachelor's degree, and produce the like proof of his having so done as is requisite in the case of a bachelor: and, further, shall compose a song in six or eight parts, and publicly perform the same, *tam vocibus quam instrumentis etiam musicis*, on some day to be appointed for that purpose, previously notifying the day and hour of performance in the manner before described; such exercise to be performed in the presence of Dr. Heyther's professor of music. This being done, the candidate shall supplicate for his grace in the Convocation house, which being granted by both the Savilian professors, or by some master of arts deputed by them for that purpose, he shall be presented to his degree.

It is observed by the authors of the "Histoire Litteraire de la France," vol vii., p. 142, and vol. ix., p. 200), that in the semi-barbarous ages music was in such high estimation that no one could omit the study of it who cultivated letters. The learned Gerbert, who arrived at the Pontificate by the title of Sylvester the Second, and many other illustrious personages, regarded it as the second branch of mathematics. But if music does no honour to the sciences at present, it is little indebted to them for the distinction of being admitted into their company during so many ages, as ignorant artists of talent and sensibility have perhaps contributed more to her perfection than all the sublime reveries and profound calculations of men of science. The first qualification for the degree of either bachelor or doctor in music was formerly the reading and expounding certain books in Boethius, as the only writings whence knowledge in the principles of the science could be acquired. But the candidate for academical degrees is no longer put to this test, he is now to compose an exercise for voices and instruments in six or eight parts, which he is to submit to the inspection of the music professor, and to have publicly performed in the music school of the University. Wood, in his "Fasti," has been able to produce no names of musicians that have been enrolled among the graduates of the University of Oxford before the sixteenth century, though we are told of several at Cambridge of an earlier period. Whether Hambois was a member of this University or of Oxford does not appear, nor indeed is it precisely known at what time he received his diploma. In Hollingshed's Chronicle, vol. ii., p. 1355, there is an enumeration of the most eminent men of learning in the reign of Edward the Fourth, among whom the author includes John Hamboys, "an excellent musician," adding that "for his notable cunning therein, he was made a Doctor of Music." But academical honours in the faculty of music may be traced up to the year 1463, when Henry Habengton was admitted to the degree of Bachelor of Music at Cambridge, and Thomas Saintwix, Doctor in Music, was made Master of King's College in the same University (Burney, vol. ii., p. 403-5).

"*Fœdera*," *Vol. XI.*, *p.* 512. *A.D.* 1463, 3 *Edw. IV.*

Pro Marescallo Ministrallorum.

Letters patent, granting to Walter Haliday, "Marescallo Ministrallorum Nostrorum," ten marks a year for his life. Dated at Northampton, 19 January.

In the reign of Edward the Fourth, says Burney, music, after "long living a vagrant life, and being passed from parish to parish, seems at length, by the favour of this monarch, to have acquired a settlement," for it appears that by his letters patent, under the Great Seal of his realm of England, bearing date the 24th of April, 1469, in the ninth year of his reign, upon a complaint that certain rude husbandmen and artificers of various trades had assumed the title and livery of the king's minstrels, and under that order and pretence had collected money in divers parts of the kingdom, and committed other disorders, the king grants to Walter Haliday (marshal), John Cliffe, Robert Marshall, Thomas Grene, Thomas Calthorn, William Cliff, William Cristean, and William Eynesham, his own minstrels, a charter, by which he creates (or rather restores) a fraternity or perpetual guild (such as the brothers and sisters of the fra-

ternity of minstrels had in times past) to be governed by a marshal appointed for life, and by two wardens (*custodes*) to be chosen annually, who are empowered to admit brothers and sisters into the said guild, and are authorised to examine the pretensions of all such as affected to exercise the minstrel profession (*artis sive occupationis ministrallorum*) and to regulate, punish, &c., throughout the realm (those of Chester excepted).

This charter of the 9th of Edward the Fourth (A.D. 1469) is printed in extenso in the *Fœdera*, vol. xi., p. 642. It is headed "Pro fraternitate ministrallorum Regis." When Charles the First, in the 11th year of his reign, was petitioned to grant a new patent to the professors of the art and science of music, the form of the above charter of Edward the Fourth was made the ground-work of the new one. (Burney, vol. 2, p. 430.)

In the *Liber Niger Domus Regis* (see Harleian MSS., No. 293, and Nos. 1147, 2, 3, 11, of the Ashmolean Collection, Oxford, for "Ordinances touching the King's Household, Temp. Ed. II. and Edw. IV.), which is an account of the household establishment of Edward the Fourth, there is mention made of the musicians in his service, as well as those for his private amusement (*propter solatium regis*), and those for the service of his chapel. "This," says Burney, "seems the origin of the Chapel Royal and King's Band."

The following extract from the *Liber Niger* is printed in Burney, vol. 2, p. 430, but the spelling I have modernised:—"MINSTRELS thirteen, whereof one is verger, which directeth them all festival days in their stations of blowings and pipings to such offices as the officers might be warned to prepare for the king's meats and suppers; to be more readier in all services and due time; and all these sitting in the hall together, whereof some be trumpets, some with the 'shalmes' and small pipes, and some are strange men coming to this court at five feasts of the year, and then take their wages of household, after fourpence halfpenny by day, after as they have been present in court, and then to avoid after the next morrow after the feast, besides their other rewards yearly in the king's exchequer, and clothing with the household, winter and summer, for each of them 20s. And they take nightly amongst them all four gallons ale; and for winter season three candles wax, six candles pitch, four talesheids (billets for fire-wood), lodging sufficient by the 'herbengere' for them and their horses nightly to the court. Also having into court two servants to bear their trumpets, pipes, and other instruments, and torch for winter nights, whilst they blow to supper of the 'chaundry;' and always two of these persons to continue still in court, at wages by the cheque-roll whilst they be present, 'iiij ob.' (? 4 pence) daily, to warn the king's riding household when he goeth to horseback as oft as it shall require, and that his household many may follow the more readier after by the blowing of their trumpets. If any of these two minstrels be let blood in court, he taketh two loaves, two mess of great meat, one gallon ale. They part not at no time with the rewards given to the household. Also when it pleaseth the king to have two minstrels continuing at court, they will not in no wise that these minstrels be so familiar as to ask rewards.

"A 'WAYTE' that nightly from Michaelmas to Shrove Tuesday pipeth watch within this court four times; in the summer nights three times, and maketh 'Bon Gayte' good watch, from the French, *Bon guet chasse malaventure*), at every chamber-door and office as well for fear of pyckeres and pillers.' He eateth in the hall with minstrels, and taketh livery at night a loaf, a gallon of ale, and for summer nights, two candles pitch, a bushel of coals; and for winter nights, half a loaf of bread, a gallon of ale, four candles pitch, a bushel coals daily whilst he is present in court for his wages in cheque roll, allowed 'iiij d. ob, or else iij d.' by the discretion of the steward and treasurer, and that after his coming and deserving; also clothing with the household yeomen or minstrels, like to the wages that he taketh; and be he sick he taketh two loaves, two mess of great meat, one gallon ale. Also he parteth with the household of general gifts, and hath his bedding carried by the comptrollers assignment; and under this yeoman to be a 'groome watere.' If he can excuse the yeoman in his absence, then he taketh reward, clothing, meat, and all things like to other grooms of household. Also this 'Yeoman-Waighte,' at the making of Knights of the Bath, for his attendance upon them by night time, in watching in the chapel, hath to his fee all the watching clothing that the knight shall wear upon him.

"CHILDREN OF THE CHAPELLE viij, found by the King's privy coffers for all that belongeth to their apparel by the hands and oversight of the Dean, or by the Master of Song assigned to teach them, which master is appointed by the dean chosing one of the number of the fellowship of chapel after rehearsed, and to draw them to other schools after the form of 'Sacotte,' as well as in song, in organs and other. These children eat in the hall daily at the chapel board, next the yeomen of 'Uestery;' taking amongst them for livery daily for breakfast and all night, two loaves, one mess of great meat, two gallons ale; and for winter season, four candles pitch, three 'talshieds' (billets of wood), and litter for their pallets of the sergeant-usher, and carriage of the King's cost, for the competent bedding by the oversight of the comptroller. And amongst them all to have one servant into the court to truss and bear their harness and livery in Court. And that day the King's Chapel removeth every of these children then present receiveth fourpence, at the green cloth of the counting-house for horse hire daily as long as they be journeying. And when any of these children come to 18 years of age, and their voices change, nor cannot be preferred in this chapel, the number being full, then if they will assent the King assigneth them to a college of Oxford or Cambridge of his foundation, there to be at finding and study both sufficiently, till the king may otherwise advance them."

"*Fœdera*," *Vol. XIII.*, *fo.* 705. *A.D.* 1520, 11 *Hen. VIII.*

DE CONFIRMATIONE PRO MINISTRALLIS.

Letters patent, dated at Westminster 23rd January, confirming in their office and privileges certain king's minstrels (named) with their marshal, &c.

"*Fœdera*" (HOLMES), *tom.* 6, *part* 2, *fo.* 115. *A.D.* 1529, 21 *Henry VIII.*

PRO MARESCALLO MINISTRALLORUM.

Letters patent, dated at Westminster 8th May, granting to *Hugo Wodehouse* the office of marshal of the minstrels which *Johannes Gylmyn* since had, "*cum vadiis decem marcarum per annum.*"

Archæologia, *Vol. III.*, *p.* 156, *A.D.* 1530, 22 *Hen. VIII.*
From a MS., dated at Eltham, Jan. 22.

This manuscript is entitled "Articles devised by his Royal Highness with advice of his council for the establishment of good order and reformation of sundry errors and misuses in his household and chambers."

Cap. 34. No herald, minstrel, falconer, or other shall bring to the court any boy or rascal.

Page 70. Eighteen minstrels are appointed at 4d. a-day each, by their names mostly Italians.

"*Fœdera*" (HOLMES), *Vol. VI.*, *part* 3, *fo.* 42. *A.D.* 1540, 31 *Hen. VIII.*

DE CONCESSIONE AD VITAM PRO FRATRIBUS IN ARTE MUSICA.

Letters patent, dated at Westminster 14th April, 1540, granting annual stipends to *Alinxus*, *Johannes*, *Anthonius*, *Jasper*, *et Baptista de Basam*, "*Fratres in scientia sive arte Musica.*"

The stipends are to Alinxus £50 per annum; to Johannes 2s. 4d. a day; to the others 20d. a-day. To be paid out of the exchequer.

"*Fœdera*" (Holmes), *vol.* 6, *part* 3, *fo.* 60. *A.D.* 1540, 32 *Henry VIII.*

Letters patent, granting to Willielmus Diemvat, "*unus ludatorum nostrorum super instrumenta musica*," an annual stipend of £38, payable out of the exchequer. Dated at Westminster 26th September.

Henry VIII.'s Scheme of Bishopricks provided that in each cathedral there should be a stated number of petty canons, laymen, and choristers, whose annual stipends were specified.

Thus in Canterbury there were eight peticanons to sing in the quere, every of them x *li.* by the yere:—xii. laye men to sing also and serve in the quere, every of them vi *li.* xiii*s.* and iii *jd.* by the yere: also x. choristers every of them v. marks by the yere.

Rochester had 6 pety canons: vi. laye men and viii. choristers. Worcester, x. peticanons: viii. laymen: & xii. choristers: & so on.

"Certain articles noted for the reformation of the 'Cathedrall churche of Excester,' provided amongst other things 'That ther may be in the said Cathedral Churche a free songe scole the scolemaster to have yerly of the said pastor and prechars xx. marks for his wages and his howsee free, to teach xl. children to rede, to write, synge, and *playe upon instruments of musike*, also to teche ther A B C in greke and hebrew.' These children were to sing and rede in the Cathedral Church, and three priests were appointed to see them well ordered at the meat and 'to reforme their maners.'"

Henry Dowes, the tutor of Thomas Cromwell's son, writes to say that he instructs his pupil "with good letters, honeste maners, *pastyme of instruments*." He says, "Laste somer was spent in the servyce of the wylde goddes Diana, this shall I truste be consecrated to Apollo and the Muses;" and speaking of the studies of the day, he says, after translating Erasmus, "he exerciseth his hande in writinge one or two houres and redith uppon Fabian's chronicle as longe; the residue of the day he doth spende upon the *lute and virginall*." (See Henry VIII.'s "Schemes of Bishopricks," edited by H. Cole. London, 8vo., 1838.)

(*To be continued.*)

THE PARIS CONSERVATOIRE OF MUSIC.

The annual examinations of the pupils of the French School of Music take place this month; and the following account of the mode in which these examinations are conducted, being from the pen of M. A. Elevart, the professor of vocal harmony in the Conservatoire, will therefore not be ill-timed:—

The examinations are divided into two series, those which are held with closed doors, and those which are open to the public, or to such of the public as can obtain tickets of admission, which on some days are as scarce as tickets for a coronation, in fact, are utterly unattainable by ordinary mortals. The private examinations include sol-fa, written harmony, thorough bass, the adaptation to the piano of a piece from an old opera; scales, organ, contrebasse, contrepoint, and fugue. This portion of the competition is carried on in the small theatre of the Conservatoire, while the public trials take place in the concert theatre; the latter include singing, grand opera and comic opera, violin, violoncello, harp, piano, and all the wind instruments played by pupils, whether civil or military, for since the suppression of the gymnasium of military music, the Conservatoire has the charge of the education of military musicians. The examination of the pupils in the dramatic classes usually terminates the public examinations. The president of the juries is M. Auber, the director of the Conservatoire. The juries themselves are nine in number; five of these consist of professors of the Conservatoire, while the other four are selected from the artistic celebrities of the capital.

The pupils in sol-fa are required to execute at sight what is called a lesson *à changements de clefs*, and M. Elevart explains this in the following terms:—"This name is given to a particular system of notation which introduces the seven positions of the three keys in an arbitrary manner, so as to test the promptitude of eye possessed by the competing pupils."

The pupils of the class of harmony have to arrange a selected piece with bass, and the fugue class to compose a fugue on a given subject; for this purpose eighteen hours are allotted, during which time the pupils are shut up in the class-rooms of the Conservatoire; the successful pupils rarely take more than eight or ten hours to complete their tasks. The other pupils, whether vocal or instrumental, have to execute a piece selected by the committee of studies; each kind of instrumentalist executes the same piece, and all, except the vocalists, have to execute a manuscript piece at sight.

Formerly there were vocal classes in the Conservatoire which competed in public. After having sung a morceau chosen by their professors, the pupils sang a manuscript piece at sight. M. Elevart regrets that this kind of vocal counterpoint has fallen into disuse in the singing classes, "as the study of vocalization and the obligation of executing at sight in public forced the singers to be musicians, that is to say, readers."

Each pupil of the singing classes admitted to the competition sings a piece chosen by the professor. There are certain airs which are repeated ten times during one day's exhibition. The air of the *Deux familles* of Theodore Labarre and that of *Norma* have often been in this position.

The public competitions occupy a whole week. They commence at nine in the morning and terminate ordinarily at about four in the afternoon. The most popular of the musical classes are those of the violin and piano, and serious and comic opera. The scenes of tragedy and comedy performed by the pupils of the declamation classes attract a special audience.

With the exception of the pit and gallery, which are nominally open to the public, admission can only be obtained by means of tickets signed by the director. These tickets are distributed amongst the ministry of Fine Arts, the directors of the Imperial theatres of Paris, and the professors of the Conservatoire. At the public distribution of prizes each prize pupil receives one or two tickets, according to the degree of the prize which he or she may have obtained. At present the distribution takes place in August, a few days after the closing of the competitive examinations, but formerly it took place in November, after the re-opening of the classes, which are closed from the first of August to the end of September. At that time the meeting was a very interesting one; the time was sufficient to allow of the music to be performed on the occasion being well studied; the accompaniments were given by a full band, and it was usual for the pupil who had gained the first prize in fugue in the preceding year to write the overture of the concert. At present the full band is replaced by a simple piano, and the first prizeman of the fugue class has no longer the opportunity of testing his powers in presence of a select public. The old practice of a symphony, composed for all instruments, and executed by the laureats of the year has also necessarily fallen with the abolition of the orchestra. These melodies used to be written by eminent composers, and the names of François Bazin, Jules Cohen, and Coradin Prumier are remembered with pleasure by habitués of the Conservatoire meetings.

THE ABATTOIRS OF PARIS.

Whatever question there may be about the policy of certain demolitions and changes made in streets, boulevards, and promenades, all the world agrees in applauding the efforts made by the authorities of great cities especially—towards the improvement of the sanitary condition of the inhabitants. The Thames Embankment; the new systems of sewerage of Paris and

London; the destruction of wretched alleys, the formation of wide streets, squares, places, and plantations, are among the greatest material benefits that have been conferred by those governments and authorities on the population at large.

The system of markets and slaughter-houses forms a most important branch of civic economy, and in this matter Paris is certainly far ahead of London; the principle of compelling so disagreeable a business as that of the slaughtering of cattle to be carried on without the walls or limits of cities, has been in practical operation in Paris for half a century. The extension of the city itself has, however, broken the rule, and the old abattoirs, or the sites on which they stood—for one or more have already been demolished—are now within the municipal enclosure. In order to meet this the city authorities are forming one immense cattle market and abattoir for the whole of Paris at Villette, an outskirt of the city, near the Northern Railway, and admirably situated as regards means of conveyance, the site being not only in close proximity to the railway in question, and with the circular railway which connects that and all the other great railways terminating in Paris, but also to the canals of the Ourcq and of St. Denis. There is no public work, except, perhaps, the great central Halles, or market, which is of such importance in a sanitary point of view as this new cattle market and abattoir. The abattoirs themselves will occupy a space of 250,000 square metres, and will, in fact, form a small town, intersected by wide streets, with a boulevard or outer street, more than sixty feet in width, and all planted with streets like the great thoroughfares of the city.

There will be no less than sixty-four slaughter-houses or abattoirs, one-half of which are now completed as far as their outer walls, and are being roofed in. The offices to be occupied by the octroi and the other officials are partly ready, and all will shortly be completed. An immense melting house, or rather series of melting-houses, octagonal buildings with projecting wings, are now being erected, so that the tallow as well as the meat will leave the abattoir in a convenient shape for being transported and manufactured.

Close to the new abattoirs will be the great cattle market, which in a very short time will supersede those of Poissy and Sceaux. The two establishments taken together will certainly form one of the most important public works in Europe.

GUN COTTON FOR SMALL ARMS.

Gun cotton, though largely used for blasting purposes in this country, has hitherto, in its employment as an explosive material in guns, not been so satisfactory as could be wished. Important progress has however been made in the practical application of gun-cotton since its study was resumed in this country about three years ago. Very large quantities of this material have been manufactured at the works of Messrs. Prentice, at Stowmarket, as well as at the Government gunpowder works at Waltham Abbey. Its application to mining and artillery purposes and also to small arms has been and still is the subject of systematic experiments conducted by the Government Committee on Gun Cotton. Its employment as a blasting agent is steadily increasing in several important mining districts in England, and a considerable, though not uniform, success has attended the employment of gun-cotton for sporting purposes.

In the early applications of this material, after Schönbein's discovery of it, great difficulty arose in its use, from the want of uniformity in its quality as well as from the absence of controlling power over its action as an explosive compound. It was found, as originally manufactured, that it was a very unstable compound, decomposing readily, and thus becoming liable to spontaneous ignition. Its true chemical composition was subsequently laid down by Hadow, and further investigations have confirmed his views; and we have been enabled, through the researches of General von Lenk, in Austria, and the valuable labours of Mr. Abel, in England, to get rid of many if not all the difficulties, and by an improved system of manufacture, carefully conducted, to produce an article which experience shows to be uniform in its character, and not liable to decomposition or spontaneous ignition. The most explosive gun-cotton is perfectly insoluble in mixtures of ether and alcohol, but by varying the proportions and strength of the acids employed for the conversion of the cotton, products of a less explosive character are obtained, which are more or less soluble in ether and alcohol (forming the well known photographic vehicle, collodion). It appears that the imperfections in the manufacture of gun cotton arise from the introduction of foreign matters in the cotton, which can, however, be almost entirely got rid of, and, at all events, so small an amount is left as to produce no practical inconvenience. The rapidity of its combustion makes it valuable as an explosive agent for blasting, but this very property renders it in its pure form useless as a propelling agent for a projectile, where a regulated rate of combustion is required, generating an explosive force which gradually expels the bullet from the piece. The rapidity with which gun-cotton burns in the open air admits of ready and very considerable variation by applying the simple expedients of winding, twisting, or plaiting gun-cotton yarn of different sizes; but although a mass of gun-cotton may be made to burn in a comparatively gradual manner by being very tightly wound, a charge of the material in that form acts quite as destructively when in the bore of a gun as an equal charge consisting of the yarn wound, since the pressure of the gas established by the first ignition of the charge renders the close packing of the gun-cotton powerless to resist the instantaneous penetration of the flame between the separate layers of the material. This method of controlling, though asserted in the early days to be effectual, has turned out to be inefficient. Several methods, however, have been tried. The one adopted by Messrs. Prentice consists of forming cartridges of the gun cotton diluted (so to speak) with cotton it its original form; and cartridges of this material have been constructed for sporting purposes, which give results that are stated to be very promising. Mr. Abel's method consists in controlling the action of the gun-cotton by consolidating the material by pressure into compact homogeneous masses, and in confining the first ignition of such compressed gun-cotton in the bore of the gun to certain surfaces. Mr. Abel accomplishes this by reducing the gun-cotton fibre to a fine state of division or pulp, as in the process of paper making, and converting this pulp into solid masses of any suitable form and density. This method of operating affords special facilities for combining both methods—dilution and compression—of reducing the explosive violence of the gun-cotton, and the results hitherto attained are very encouraging. A systematic course of experiments is now in progress, with the object of preparing the material for artillery purposes. A third method has been adopted by Mr. Dixon, who, instead of preparing his explosive material in the form of cotton, or cotton wool, and then dealing with the material by weaving, twisting, or plaiting, combined with some diluting agent, takes the woven material in the first instance and treats this with the combined acids of the proper strength, at the suitable temperature, subsequently washing the material in running water for a lengthened period, as in the most approved methods of making gun-cotton. Strips of this material, which the inventor terms gun-cloth, of suitable width and length, are then loosely rolled with thin tissue paper between the layers, thus accomplishing the dilution necessary for reducing the rapidity and violence of the explosion, and rendering the material suitable for the expulsion of the bullet. This roll is dropped loosely fitting into a cartridge, and is thus adapted for the rifle or for general sporting purposes. Mr. Dixon,

it is stated, uses also a silica solution for further diluting the gun-cotton if required, and by varying the breadth and length of the tissue paper, he is enabled to modify the rate of explosion at different portions of the cartridge, adapting it in such a way as to render it most effective for the expulsion of the bullet. Some interesting experiments with these cartridges took place a few days since at Messrs. Bussey's factory in Holborn, with excellent results. Mr. Dixon states that by using the gun-cloth he attains a greater regularity and uniformity of manufacture, and by his method of rolling it combined with the tissue-paper he obtains, by a simple, easy, and inexpensive process, a perfect means of regulating and adapting the discharge to the purpose for which it is required. As compared with gunpowder the gun-cloth cartridge for equal effect weighs one-third that of the powder. It may be dipped and thoroughly soaked in water, and after drying may be used immediately with unimpaired effect. This remark of course applies as well to other forms of gun-cotton. The experiment was tried at Messrs. Bussey's, and a cartridge having been soaked was dried and fired within three minutes.

Looking at the progress which has been already made in the manufacture and treatment of this material in the hands of Mr. Abel, aided by the elaborate series of experiments conducted and going on under his superintendence, as well as to the practical intelligence of Messrs. Prentice and Mr. Dixon and others, there is no reason to doubt that the application of gun-cotton with great advantage to some of the more important purposes for which gunpowder is used, will, ere long, be fully established.

Fine Arts.

Stained Glass.—Count de Neuwerkerke, the Superintendent of Fine Arts, has ordered the collection of stained glass belonging to the Louvre to be placed in the windows of the gallery, or rather of the rooms known as the chambers of Henry II. and Henry IV., and the vestibule adjoining. The collection of the Louvre comprises those made by MM. Durand and Révoil, enriched by additions from the famous gallery of Sauvageot. The expressed intention of the superintendent is that these specimens of painted glass should be exhibited exactly as drawings are, and he has therefore rejected all decorative arrangement, as tending to add to these fragments which time has spared something which did not belong to them, and which might have given rise to confusion and error. The specimens will, as far as possible, be arranged in the order of their dates, and the collection, when completed, will exhibit an unbroken series of specimens of the art from the time of Louis XII. to that of Louis XIV.

Exhibition of the Works of Deceased Artists.—A *brochure* has appeared in Paris, under the title of *Les Expositions Posthumes*, in which the author, M. Maret Leriche, complains that the reputations of great artists are placed in danger by collective exhibitions of their works too soon after their death, before partizanship and hostility have had time to cool down. The plan proposed by the writer is that the Government should from time to time, say every ten years, add a posthumous gallery to those of the annual exhibitions of living artists.

Commerce.

The Porter Trade of Dublin.—The immense growth of the trade in malt liquors in Ireland is evidenced in the increasing exports from Dublin. The shipments have risen from 86,735 hhds. in 1854, to 229,674 hhds. in 1865, quite irrespective of the home consumption, which is now very considerable. Messrs. Guinness and Co. alone ship as much as all the other eight Dublin brewers combined. Last year 200,000 barrels of malt were consumed in this brewery, all of which w[illegible] grown in Ireland, and allowing a yield of say 15 b[illegible] per statute acre, this must have been the produce of [illegible] than thirteen thousand acres of land. The compar[illegible] size of this brewery contrasts very favourably with [illegible] of similar concerns in England and elsewhere. From [illegible] official return of 1840, the quantity of malt stated a[illegible] was only then reached by one brewery in England, [illegible] of Messrs. Barclay. At that period the consumption [illegible] Messrs. Guinness did not greatly exceed a f[illegible] of its present quantity; while it appears from the [illegible] duty returns of last year that there are only four brew[illegible] in England who now reach more than 200,000 bar[illegible] and that the largest of these does not exceed 300,[illegible] barrels in their yearly brewings. With respect to [illegible] breweries of other countries, the largest on the contin[illegible] that of M. Driker, of Vienna, does not brew more t[illegible] 100,000 barrels of malt per annum. The ferment[illegible] tuns in Guinness's brewery, square oaken v[illegible] eight in number, are of very large capacity, some of [illegible] holding 1,100 hogsheads. The vats are nearly 10[illegible] number; many of them hold 3,000 barrels, being [illegible] 26 feet in depth and 29 feet in diameter; the enor[illegible] number of casks required for the trade may be rea[illegible] from the statement that the stock is about 125,000, [illegible] that the arrangements for cleansing by machinery [illegible] such that 6,000 casks can be turned out in twenty-[illegible] hours. One hundred coopers are kept constantly [illegible] ployed making casks, and there are 500 workmen [illegible] employed. The consumption of coal averages 150 [illegible] per week, and the quantity of water, used either for [illegible] ing or cleansing purposes, is about 400,000 gallons [illegible] The number of brewers in Ireland in 1864 was [illegible] of victuallers 15,578, and the quantity of malt [illegible] wetted 316,974 quarters. In comparison with the [illegible] 1843 there are 63 brewers less, 2,652 victuallers [illegible] and an increase of 190,717 quarters in the consum[illegible] of malt.

The Beet Crop in France.—On this subject [illegible] *Journal des Fabricants de Sucre* says:—"Two sco[illegible] threaten the beetroot crop—the white worm and [illegible] want of labour. In several localities this formi[illegible] insect has commenced its ravages; whilst in a radius [illegible] tending from the Aisne, the Somme, and even from [illegible] Oise, they cannot, for want of labourers, succeed in [illegible] dressing the plant at an opportune season, or free it [illegible] the weeds that choke it. This may be very satisfac[illegible] to the enemies of the precious root, but let them not [illegible] maturely rejoice. The evil we notice is limited, and [illegible] white worms, however numerous and voracious they [illegible] be, cannot devour the whole crop, favoured as it [illegible] this long week of rain, which has enabled it to put [illegible] its leaves, and the better to support the summer hea[illegible] short, the general appearance of the crop is satisfac[illegible] and we may still adhere to our former estimate of [illegible] result, which, although it will be considerably less [illegible] that of last year, will in all probability be a fair [illegible]

The Cotton Trade.—The total quantity of c[illegible] imported into the United Kingdom in 1856 [illegible] 1,023,886,304 lbs.; in 1857, 969,318,896 lbs.; in [illegible] 1,034,342,176 lbs.; in 1859, 1,225,989,072 lbs.; in [illegible] 1,390,938,752 lbs.; in 1861, 1,256,984,736 lbs.; in [illegible] 523,973,296 lbs.; in 1863, 669,583,264 lbs.; in [illegible] 893,304,720 lbs.; and in 1865, 977,978,288 lbs. In [illegible] sequence of the great and general reduction of [illegible] European stocks of cotton, the exports of cotton from [illegible] United Kingdom have very greatly increased of [illegible] having been 146,660,864 lbs. in 1856; 131,927,600 [illegible] 1857; 149,609,600 lbs. in 1858; 174,143,136 lbs. in [illegible] 250,339,040 lbs. in 1860; 298,287,920 lbs. in [illegible] 214,714,528 lbs. in 1862; 241,352,496 lbs. in [illegible] 214,702,304 lbs. in 1864; and 302,908,928 lbs. in [illegible] The excess of the imports of cotton was th[illegible] 877,225,440 lbs. in 1856; 837,391,296 lbs. in [illegible] 884,732,576 lbs. in 1858; 1,050,845,965 lbs. in [illegible]

1,140,599,712 lbs. in 1860; 958,696,816 lbs. in 1861; 309,258,768 lbs. in 1862; 428,230,768 lbs. in 1863; 648,602,716 lbs. in 1864; and 675,069,360 lbs. in 1865. It was a small increase last year in the quantity of cotton available for British consumption which enabled prices to be so well maintained after the termination of the American war. Thus in 1859 cotton averaged 6·76d. per lb.; in 1860, 7·17d. per lb.; in 1861, 7·39d. per lb.; in 1862, 14·24d. per lb.; in 1863, 21·97d. per lb.; in 1864, 21·01d. per lb.; and in 1865, 16·20d. per lb.

IMPORTS FROM BRITISH INDIA.—The entire value of the imports into the United Kingdom from British India, exclusive of Ceylon and Singapore, amounted last year in round numbers to thirty-seven and a-half millions sterling. Compared, however, with the figures for 1864, a falling off is apparent of very nearly fifteen millions. This decrease has arisen in a great measure from diminished supplies and depreciation in the price of raw cotton; likewise from a considerable reduction in the amount of sugar sent to this country. The latest completed annual statement of the trade between the United Kingdom and British India is that for 1864, from which it appears that in that year the aggregate value amounted to £52,295,599, a sum of a magnitude unparalleled in the import statistical records of this kingdom. Of the total not less than £37,899,651 is set down for cotton; and in illustration of the facility with which the inhabitants of India adapted their resources to the production of that important article of commerce, it may be observed that in the year preceding the outbreak of the civil war in the United States, the value of such imports only slightly exceeded three millions sterling. The other most important items are coffee, gums, jute, hides, indigo, rum, sugar, tea, &c. On reference to the statistical account for the three years preceding it appears that the aggregate import values were as follows:—In 1860 they amounted to fifteen millions; in 1861 to twenty-two millions; and in 1862 to thirty-four millions; so that in the last quinquennial period the increase has been considerably more than three-fold.

Colonies.

EMIGRATION FROM GREAT BRITAIN.—The number of emigrants to the Australian colonies last year was 37,283 persons; in 1864, 40,942; in 1863, 53,054. The greatest number recorded was in 1852, 87,881. To the North American colonies the emigration comprised, last year, 17,211; in 1864, 12,721; in 1863, 18,083. The largest emigration was in 1861, 43,761. The emigration to the United States in 1865 was 147,258; in 1864, 147,042; in 1863, 146,813; in 1861, 49,764. The total emigration to all parts in 1865 comprised 209,801; in 1864, 208,900; in 1863, 223,758; in 1862, 121,214; in 1861, 91,770; in 1860, 128,410; in 1859, 120,432; in 1858, 113,972; 1857, 212,875; and in 1856, 176,554.

EMIGRATION TO QUEENSLAND.—From the report of the Emigration Commission to this colony it appears that during the last ten years the number of emigrants from the United Kingdom has annually decreased. The fifth year of the Queensland emigration under the Land Order System shows a larger number than during any year since its establishment in May, 1861. During the five years that the Land Order System has been established 33,483 have been sent to that colony. The total emigration from Great Britain to Queensland during the last year was 1,152 persons. The assisted emigrants were reduced last year to 688, showing a falling off since last year of 972, and the income amounted only to £10,073 4s. up to 31st March, including the amount of £1 paid by the free passengers. The number of full-paying passengers has been 1,546, nearly an equal number to those despatched in the previous year. In one ship alone the capital taken by the passengers was found to be about thirty thousand pounds, a large portion of it belonging to the intermediate and steerage passengers.

THE ANGOLA IN VICTORIA.—The Acclimatization Society of this colony, some three years ago, initiated experiments with a view of testing the worth of the Angola wool, and having become convinced of its value, they proceeded to procure the introduction of the Angola goat, having recently received a ship load of 93 of the best specimens. Within a very few years it is anticipated by many that Angola wool will occupy as important a place in Victoria exports as merino wool does at present. The society has also turned its attention to the ostrich, and has made arrangements to procure a large number of these birds from Cape Colony, it being thought that they will thrive in Victoria as well as in Africa.

QUEENSLAND SUGAR.—There seems to be some difficulty in the way of manufacturing sugar from the juice of the Queensland-grown canes. Whether the fault is with the operators or the machinery it cannot be said; the juice is reported everywhere to be all right, and no doubt this slight hitch will soon be got over. In the meantime very fair samples are frequently being sent to Brisbane. Persons of some experience state that from what they have seen they believe that the small Otaheitan and ribbon canes are the most suited to the climate of this colony.

Notes.

PRESERVATION OF LEMONS.—A correspondent of the *Pharmaceutical Journal* (Mr. Mee) writes that lemons may be preserved by the very simple process of varnishing them with a solution of shellac in spirits of wine. Fresh lemon juice is thus obtainable at all seasons of the year; and if the peel be required for flavouring, the skin of shellac may be easily removed by simply kneading the elastic lemon in the hands.

PARIS UNIVERSAL EXHIBITION.—REGATTAS ON THE SEINE.—The Imperial Commission state that it is their intention to organise in connection with the exhibition a series of international regattas, Venetian fêtes, &c., and invite the co-operation of England, and especially desire that the Universities of Oxford and Cambridge shall be represented. It is intended to hold these regattas on the Seine, a portion of the quay of which will be connected with the park of the Exhibition. A special building will be erected on the quay for the exhibition of all matters connected with navigation, including marine engines (which, it is proposed, shall be exhibited in motion), life-boats, apparatus for saving life, &c. Small yachts and boats of all kinds will be exhibited on the Seine immediately in front of the quay. A certain space on the quay is offered to England, and our countrymen who may desire to take part in this friendly competition are assured that they will meet rivals worthy of them. Amongst other objects that will be shown there are the marine engines of Indret of 1,000 horse-power, which will be set in motion by steam furnished from their own boilers.

PISCICULTURE IN NORWAY.—Reports from Norway say that great success has attended pisciculture in that country. The rivers, formerly so full of fish, had, for want of proper regulations concerning fishing, almost ceased to yield any, when it was determined to make an attempt to restock them. The rivers Drammen, Mandol, Christiansand, and Laagen are said to have had 200,000 young salmon turned into their waters, and the fish are thriving in a remarkable degree. The salmon and the sea trout have also been successfully introduced into the lakes of Wettern and Wofferstadt, whence there is no outlet to the sea. Further, it is said that during the last five years, successful attempts have been made to stock lake Soranes, known as the dead lake, because no fish had ever been seen in it. M. Hanson de Stavanger is said to have succeeded in fecundating by

artificial means two distinct species of salmon reciprocally. These facts, which have been published by the secretary of the Paris Société d'Acclimatation, are curious, and well deserve the attention of proprietors of lakes and other waters.

MUSEUM OF THE ANTIQUITIES OF PARIS.—The intended establishment, at the Hôtel de Ville, in Paris, of a museum of the antiquities of the city, has already been mentioned in the *Journal*. The Municipal Council of the Seine has just purchased, in furtherance of that intention, a large collection of drawings, engravings, plants, and medals relating to the history of ancient Paris, of M. Gailhabeaud, for 125,000 francs (£5,000). With such additions as these the Antiquarian Museum of Paris will soon become important.

Correspondence.

MEMORIAL TABLETS.—SIR,— I beg to draw the attention of the Tablets' Memorial Committee to the fact, that the keeper of the public-house, at No. 17, Fetter-lane, has placed over his shop front a label inscribed, "Here lived Dryden, the poet."—I am, &c., ALAN S. COLE.

South Kensington Museum, July 17, 1866.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 11th July, 1866.

Par. Numb.

209. Bill—Inland Revenue.
366. Vicarages and Curacies—Return.
385. Writs Registration (Scotland) Bill—Report and Minutes of Evidence.
397. General Committee of Elections—Mr. Speaker's Warrant.

SESSION 1865.

442. (B. I.) Poor Rates and Pauperism—Return (B).

Delivered on 12th July, 1866.

188. (I.) Penal Servitude Act—Return.
369. Electors, &c. (Ireland)—Return.
375. Public Works (Manufacturing Districts) Acts (1863-4)—Report of R. Rawlinson, Esq.
388. Benefices (Metropolis)—Return.

Delivered on 13th July, 1866.

204. Bill—Court of Session (Scotland).

Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation, No. 15.

Delivered on 14th July, 1866.

207. Bill—Prisons (Ireland).

Births, Deaths, and Marriages (England)—Twenty-seventh Annual Report.

Children's Employment—Fifth Report of Commissioners.

Delivered on 16th July, 1866.

372. Metropolitan Workhouse Infirmaries, &c.—Report of Dr. Smith.
393. Ordnance Survey (Ireland)—Statements.

Delivered on 17th July, 1866.

377. Poor Law Unions (Ireland)—Return.
386. Official Liquidators—Return.
394. Bakehouses Regulation Act—Reports.
398. Army Services (1866-7)—Supplementary Estimate.

Patents.

From Commissioners of Patents' Journal, July 13th.

GRANTS OF PROVISIONAL PROTECTION.

Alkaline permanganates, obtaining—1726—C. E. Brooman.
Axle-trees, &c., applying packing to—1699—C. P. Holliss.
Bottle fountains—1652—J. Nadal.
Brackets—1743—M. L. J. Lavater.
Brick-making machines—1739—J. H. Johnson.
Bricks—1754—H. A. Bonneville.
Bricks—1768—A. P. J. Allemand and L. G. Speyser.
Carriages, springs for—1670 T. Whitley.
Carriage windows—1735—J. Imray and J. Ellis.
Coals, screening—1682—W. Poupard.
Complexion, beautifying the—1446—J. Lewenberg.
Connecting links and hooks—1785—A. V. Newton.
Cotton gins—1769—G. F. Starnes.
Cotton gins, saws for—1758—T. C. Craven.
Electric telegraphic machines—1725—F. T. Hubert & H. D. G. Truscott.
Fatty matters, distilling—1778—C. Doughty.
Fibrous materials, treating—1629—J. G. Marshall.
Files, cutting—1715—J. Henshall.
Fishing—1755—G. Frère.
Gas—1348—A. V. Newton.
Glass, cutting—1673—C. de Grelle.
Governors—1777—M. Henry.
Gums, treating—1667—E. Hunt.
Gunpowder, non-explosive, rendering—1721—H. D. Plimsoll.
Hard water, softening—1180—T. W. Tobin.
Horticultural glass houses—1580—J. Cranston.
Human body, applying heat to the—1753—H. A. Bonneville.
Iron ores, smelting—1734—H. Hobson.
Leather—1746—T. F. Gillot.
Leggings, &c., fastenings for—1773—A. Myerns.
Locks—1638—G. H. Hopps.
Locomotive and traction engines—1757—C. J. Appleby.
Locomotive engines and tenders—1781—R. Fowler.
Locomotive traction engines—1728—D. K. Clark.
Lubricating purposes, apparatus for—1759—J. H. Johnson.
Materials, treating—1693—G. Charles-Ange.
Metals, drilling—1729—S. Deacon.
Mineral substances, treating—1350—W. Prosser.
Miner's safety lamps—1610—W. H. Hall and J. Cooke.
Motive power, obtaining—1767—W. Adolph.
Mowing and reaping machines—1738—R. Hornsby.
Printing ink—1737—S. Holmes.
Pulse grain and seeds, decorticating—1724—J. H. Johnson.
Rafts—1660—L. Hart.
Railway passenger trains in motion, facilitating the passage of persons along the outside of—1748—W. J. Baker.
Railway rolling stock—1745—T. Macneill.
Railways, actuating the switches of—1732—W. Thomson.
Reaping and mowing machines—1764—H. Tyerman.
Ribbed pile fabrics—1774—J. Clegg and J. Smith.
Rulers—1620—R. E. Hodges.
Safes—792—T. Sagar and G. Keighley.
Safes—1598—F. W. Kurz.
Self-acting railway signals—1766—H. Wootton.
Sewing machinery—1779—A. V. Newton.
Spinning frames—1747—C. D. Knapson.
Stays and corsets, busks of—1771—R. A. Young.
Steam engines, pistons of—1700—W. Buckley and L. Smith.
Steering apparatus—1783—A. V. Newton.
Studs and buttons—1733—J. Ashton.
Valves—1740—H. Griffin.
Vegetable fibres, treating—1761—W. Staufen.
Venetian blinds and fittings—1706—E. Ambrose.
Washing machines—1731—L. S. Pilkington.
Weaving, looms for—1630 - W. Robertson and J. G. Orchar.
Weaving, looms for—1776—T. Sagar and T. Richmond.

PATENTS SEALED.

119. A. S. Brooman.	166. D. Adamson.
130. J. Hooker.	198. C. W. Orford.
131. F. Campbell and W. Burgess.	211. B. Walker & J. F. A. Pflaum.
134. A. S. Brooman.	223. W. Clark.
136. A. V. Newton.	251. T. Marshall & H. C. Pracy.
138. D. F. Lecocq.	256. J. H. Johnson.
140. C. H. Roeckner.	275. A. B. Childs.
141. M. A. Muir and J. McIlwham.	285. W. Clark.
143. J. Samwells and S. Nye.	382. W. S. Laycock.
147. W. C. Mann.	385. J. B. Atwater.
148. R. Cherry, E. Crossley, and W. Bower.	591. J. H. Johnson.
	663. W. A. Vérel.
152. W. Ager.	699. G. T. Bousfield.
155. C. J. Crondace and J. Field.	727. A. V. Newton.
157. T. Allen.	669. G. McKenzie.
158. J. Banfill.	967. E. Pearson.
159. J. Wyld and J. Kershaw.	1254. H. A. Mansfield.
160. E. & T. Feather, and J. Luty.	

From Commissioners of Patents' Journal, July 17th.

PATENTS SEALED.

169. W. Hibbert.	287. J. Berrie.
173. J. A. Nicholson.	288. J. B. Dalhoff.
175. J. Shekleton & J. W. Gibson.	303. R. Clayton, J. Raper, J. Goulding, & W. Howarth.
184. G. Tanner and G. Parkes.	
190. W. E. Gedge.	335. J. and P. Warburton, and S. Barnes.
192. J. B. Shillcock.	
193. A. Bryson.	409. G. F. Russell.
194. W. K. Hall.	437. A. V. Newton.
201. J. Dearden and E. P. Holden.	642. V. Larnaudès.
225. G. Bear.	853. W. Clark.
244. L. D. Phillips.	1378. H. Grafton.
259. E. Ambrose and W. Braddon.	1384. G. Haseltine.
267. M. A. F. Mennons.	1449. G. Haseltine.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1773. M. Henry.	1771. W. Clark.
1734. M. W. Ruthven.	1774. R. A. Brooman.
1738. R. A. Brooman.	1760. J. Davidson.
1753. L. M. Bournique and J. B. Vidard.	1770. W. T. Cheetham.
1754. L. M. Bournique and J. B. Vidard.	1881. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1647. W. E. Newton.

Journal of the Society of Arts.

FRIDAY, JULY 27, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for next year is in preparation, and will shortly be ready for issue.

Proceedings of Institutions.

BIRMINGHAM (MESSRS. CHANCE'S LIBRARY AND READING ROOM).—This Institution maintains a good average state of prosperity. The number of members for 1864 was 178, and for 1865 it was 172 per quarter. The reading room and library are open from nine in the morning till ten at night. The subscription is one shilling per quarter. The first subscription of one shilling constitutes membership, and entitles the member to all the privileges of the Institution. The penny entertainments, which were commenced in the winter of 1864, have been a popular feature of the work of the Institution. Seven were given in the winter of 1864-5, and four others in the latter part of 1865. The proceeds of one of these was given towards the funds of the South Staffordshire Educational Association, a fee of 6d. being charged to a portion of the room. Upon several occasions the music given has been of a very superior order, and upon all occasions the audience has been most attentive and enthusiastic. The thanks of the community are greatly due to those ladies and gentlemen who have contributed so liberally to the interest of the entertainments, by their excellent readings and music. It has not been a design to make them a source of profit, but it is satisfactory to know that they have paid their way. The expenses of refreshments, railway fares, and other incidental expenses, are considerable, and the engagement of professional assistance is now rendered necessary by the difficulty of securing a sufficiently large and constant supply of local talent. This increased expenditure has been met by a necessary increase in the rate of admission to one portion of the school room. The receipts in 1864 amounted to £39 19s. 1d., and the expenses to £34 8s. 6d. In 1865 the receipts were £44 7s. 5d., while the expenses were £39 4s. 7d. This statement of receipts is exclusive of the librarian's salary, expense of repairs, coals, and gas, which are the annual contribution of the Messrs. Chance to the library and reading room. The library was, in 1864, enlarged to the extent of £25 from the same source. The receipts for the eleven entertainments given during 1864 and 1865 were £21 12s. 6d., and the expenses were nearly as great, the balance in hand being £1 12s. 3d.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(Continued from page 579).

ELECTRICITY AND MAGNETISM.

THREE HOURS ALLOWED.

1. State the direction of the lines of magnetic force between the poles of a bar-magnet, and the means of observing them.

2. What is the nature of magnetic force? Can it properly be called an attractive force? Give an experimental proof of your answer.

3. What elements of the earth's magnetism have been observed and recorded, and by what instruments?

4. How may the errors of a ship's compass be ascertained and corrected?

5. Describe the peculiar magnetic properties of *bismuth*, and mention other bodies possessing similar properties.

6. Explain the two kinds of free electricity, and the means of distinguishing between them.

7. Describe the action of an insulated electrified body on other bodies near, but not in contact with it.

8. Explain the different effects produced when a *point* or a *knob* is presented to an electrified body; and apply this principle to the construction of a lightning conductor.

9. How is a voltaic current produced? What actions occur in any given element of a battery?

10. What forms of battery are preferred for (*a*) uniformity, (*b*) durability, and (*c*) intensity of current?

11. Describe some of the processes employed in electro-metallurgy.

12. What means have been adopted for testing the insulation of a submarine cable in the course of construction?

13. Explain the construction of a Morse printing telegraph.

14. Explain Wheatstone's "bridge," and its application in discovering a *fault* in a circuit.

15. What must be the relative directions of two currents, that one may rotate round the other? Explain the cause of the rotation.

16. Describe the construction of a thermo-electric pile, and the form generally adopted in experiments on radiant heat.

17. Describe the electric organs of the torpedo.

18. In what kind of animals do manifestations of electric force continue longest after death? How may a battery be constructed of dead animal tissue?

LIGHT AND HEAT.

THREE HOURS ALLOWED.

GEOMETRICAL OPTICS.

1. State the law of the intensity or brightness of light, at different distances, from a luminous origin of light. Show how this law is employed in photometry to find the relative brightness of lights, describing some form of a photometer, and the mode of using it. If a gas flame at 10 feet distance gives an equal illumination on a screen with a lighted candle at 4 feet, what is the illuminating power of the gas light compared with that of the candle.

2. When an image of an object is formed by *a convex spherical mirror*, show that it is always *virtual*, *erect*, and *diminished*. Show how a convex mirror is employed in Cassegrain's telescope, and show how it then furnishes a *real* secondary image of the distant object towards which the telescope is directed.

3. Explain how the prismatic spectrum is formed when a beam of light passes through a refracting prism. State the circumstances to be attended to in order to obtain a pure prismatic spectrum. What are meant by Fraunhofer's fixed lines of the solar spectrum?

4. Explain the causes of long and short-sightedness, and show the forms of the lenses required to correct them respectively. When the eye views an image of an object through a single convex lens, as a simple microscope, show how the magnifying power arises, and find an expression for it.

PHYSICAL OPTICS.

5. Enunciate the law of the ordinary refraction of light by transparent media, and name some media for which it holds good, both crystallized and uncrystallized. Describe the nature of the refraction in the crystals called uniaxal crystals, and also in those called biaxal crystals.

6. Describe the construction of a simple polariscope made with pieces of window glass. Show the properties of the reflection at transparent surfaces on which it acts, and describe the experiments which may be tried with it.

7. Show how the property of interference of light is demonstrated by the experiment with the two mirrors slightly inclined, or the obtuse-angled prism. Explain how interference proves the property of periodicity in light, and show how the luminiferous interval can be measured for any given colour.

8. Describe the apparatus required for showing the rings and brushes seen in polarized light around the optic axes of uniaxal crystals. Show the circumstances when the black and bright brushes are seen respectively. Describe also the appearance when the light is either *circularly* polarized or *circularly* analyzed.

Heat.

9. Explain what is meant by radiant heat, and state the properties which it possesses in common with light. Describe an experiment which shows that the amount of radiation from the surface of a heated body depends greatly on the state of the surface.

10. Describe the construction of the differential air thermometer, and show the advantages it possesses in certain cases. State some experimental investigations where it would be more useful than a common thermometer.

11. Explain what is meant by the specific heat of bodies, and describe the method of finding it for solid bodies by the method of immersion. The specific heat of water being taken as unity, what are the specific heats of iron, silver, and lead?

12. Show how the elastic force of vapours can be determined when less than that of the atmosphere. Describe the construction and mode of action of the old atmospheric pumping engine. What were its disadvantages?

CHEMISTRY.

THREE HOURS ALLOWED.

No candidate is allowed to answer more than three questions in each division.

First Division.

1. Describe by an equation the action of hydrated sulphuric acid on manganic binoxide. What weight of the binoxide would be needed for the preparation of a kilogramme of oxygen? Mn. $= 55$; O $= 16$.

2. The equation $fe^3 + (H^2\,O)^4 = fe^3\,O^4 + H^8$ represents the action of steam on red-hot iron. What weight of iron is thus oxidized by the decomposition of 9 kilogrammes of steam? $fe = 56$; $H = 1$.

3. 500 cubic centimetres of pure and dry air were measured off at 0° C, and 760 millimetres barometric pressure, and mixed with 250 cubic centimetres of hydrogen under like conditions. What will be the volume of the residue after explosion, and what its per-centage composition?

4. What volume of oxygen is needed for the combustion of a litre of sulphuretted hydrogen? What volume of sulphurous acid is formed?

5. Describe and explain the manufacture of phosphorus from bone earth. How is red phosphorous prepared from clear phosphorus.

6. How would you separate silica from the other constituents of felspar, viz. alumina and potash.

Second Division.

7. A solution acid to test paper is precipitated black by the action of sulphuretted hydrogen. How would you examine the precipitate for the detection of the metals contained in it?

8. A strongly akaline liquid forms a white precipitate by the action of hydric sulphate ($H^2\,SO^4$). Chlorine forms a brown precipitate in the original solution. The brown precipitate is soluble in strong hydrochloric acid with evolution of chlorine and formation of a crystalline chloride. What would you suspect the original liquid to have contained, and how would y… test it?

9. Describe the ordinary process for the manufactu… of metallic lead, and the separation of silver from le…

10. What compounds of manganese are there analog… respectively to compounds of calcium, iron, sulphur, … chlorine? How do these compounds decide the ato… weight of manganese, its equivalent weight being p… viously known?

11. Describe by equations the following reactions, vi… I., the precipitation of argentic nitrate (nitrate of silv… by hydro-di-sodic-phosphate (common phosphate of so… II. The action of strong hydrochloric acid in ex… on potassic dichromate (red chromate of potash). I… The action of sulphuretted hydrogen on bism… chloride.

12. How is magnesia prepared? How metallic m… nesium? Describe the chief reactions of the salt… magnesia.

Third Division.

13. How is pure alcohol obtained from sugar?

14. Describe the preparation of pure benzole? W… is its composition? How much heavier than hydro… is its vapour? What does commercial benzole usu… contain?

15. Describe by an equation the action of litharge … water on stearine.

16. What is the meaning of the term amide? … scribe the formation and chief properties of aceta… oxamide, and carbamide.

17. What are the constituents of coal gas? … could you prove the presence of each of them in … gas?

18. The silver salt of an organic acid yielded … combustion 114 per cent. of carbonic acid and 4… cent. of water. It was also found to contain 55·… cent. of silver. Calculate the formula of the salt.

(To be continued.)

MUSIC IN ENGLAND.

BRIEF NOTES ON MUSIC IN ENGLAND FROM THE TI… THE ANGLO-SAXONS TO THE COMMENCEMENT OF … 18TH CENTURY, AND THE AID AFFORDED BY … CROWN, &c., TO ITS SUPPORT.

(Continued from page 684).

Edward VI.

In Burney's General History of Music, vol. iii., pp. 4, 5, and 6, is an account of the musical establishments of the Household and Chapel Royal in the reign of Edward the Sixth, with the names of the musicians, their instrum… and fees. The names of the officers and gentlemen of the "Chappell," are also given with their fees.

Musitions and Players.

	Fee. £	s.
Trumpeters:—		
Serjeante. Benedict Browne	24	6
Trumpeters, in No. 16, every of them having by the yere £24 6s. 8d............	389	6
Luters—Philip Van Welder and Peter Van Welder	40	0
Harpers { William Moore	18	5
Harpers { Bernard de Ponte	20	0
Singers—Thomas Kent and Thomas Bowde, £9 2s. 6d. each	18	5
Rebecke—John Seuernicke	24	6
Sagbuts. In number six, whereof five havinge £24 6s. 8d. by the yere, and one at £36 10s.	458	3
Vyalls. In number 8, whereof 6 at £3 08s. 4d. the yere, and one at £2, and another at £18s. 5s.......................................	290	15
Bagpiper—Richard Woodward	12	3
Minstrilles. In number 9, wherof 7 at £18 5s. a-piece	127	15
„ 1 at £24 6s. 8d., and 1 at £3 6s. 8d.	27	13

		£	s.	d.
Dromslades (? drum-beaters). In noumber 8, whereof Robert Bruer, master drummer		18	5	0
Alexander Pencax and John Hodgkin, £18 5s. a-piece		36	10	0
Players on the Flutes	Oliver Rampons	18	5	0
	Pier Guye	34	8	4
Players on Virginals	John Heywoode	50	0	0
	Anthony de Chounte	30	8	4
	Robert Bewman	12	3	4

NOTE.—The Virginal is a keyed instrument of one string, jack, and quill, to each note, like a spinet, but in shape resembling the present small piano-forte (1789). It has been imagined to have been invented in England during the reign of Queen Elizabeth, and to have been thus denominated in honour of that virgin princess; but we have here not only a proof of its use in this kingdom before she was queen, but a drawing and description of it appeared in Luscinius's "Musurgia" before she was born.

Musitions Straungers.	The four brethren Venetians, viz.:—John, Anthonye, Jasper, and Baptiste	16	6	8
	Augustine Bassane	36	10	0
	William Trosses and William Deniuat	76	0	0
Players of Interludes, in noumber 8, every of them at £3 16s. 8d. by yere		26	13	4
Camera 7, £23 6s. 8d; in scaccario £3 6s. 8d.				
Makers of Instruments.	William Beton, organ-maker	20	0	0
	William Tresorer, regal-maker	10	0	0
Summa totalis		£1,732	0	0

Total number of persons, 73.

OFFICERS OF THE CHAPPELL.

Master of the children, Richard Bowyer, Fee	40	0	0
Largess to the children at high feasts	9	13	4
Allowance for breakfast for the childre	16	0	0
Gentlemen of the chappell, 32, every of them 7d. *ob.* a day:— Emery Tuckfield, Robt. Chamberleyn, Willm. Barber, John Bendebowe, Robt. Morecock, Richd. Ayleworth, Thos. Palfreyman, Richd. Farrant, John Kye, John Angel, Wm. Huchins, Nich. Archibald, Willm. Grauesend, Robt. Richmounte, Willm. Mawpley, Robt. Phelips, Thomas Birde, Robt. Perry, Thos. Wayte, Thos. Talles, Thos. Wright, Robt. Stone, William Walker, Richd. Bowyer, Nich. Millowe, George Edwards, J. Sheppardе, Wm. Hynnes, or Hunnes, Thos. Maune, Roger Kenton, Lucas Caustell, Edward Addams	365	0	0
'wo at 4d. *ob.* a day either of them; five at 4d. the day every of them; Hugh Williams at 40s. a yeere	46	2	1
Summa totalis	£476	15	5

he number of boys (children) in the chapel is not given.

The sum total of the annual fees paid to the two estab-hments amounts to £2.208 15s. 5d., being for the "Mu-:ions and Players," £1,732, and for the "Officers of the happell," £476 15s. 5d. The number of persons was 73 usicians, and 41 officers of the chapel. The authority r these details is stated by Burney to be a MS. in the ritish Museum, but he does not give a reference to it.

It was during the reign of Edward VI. that metrical almody became general in the parish churches in ngland.

On the 19th June, 1547, a "*dirige*" was sung at St. Paul's d other churches in London, for the death of Francis I., d on the next day the Archbishop of Canterbury sang a mass, or requiem, in the choir of St. Paul (Heylin. *Ecclesiastical History*); and in September of the same year the Litany was sung in the English tongue in the same Cathedral, Bishop Bonner being in the Fleet prison.

The "compline" being part of the evening prayer, a kind of final chorus, was sung in English in the King's Chapel, in the year 1547, before any Act of Parliament enjoined it. (*Burney*.)

QUEEN MARY.

By a record in the possession of the Society of Antiquaries, it appears that the chapel establishment of this Queen was pretty much on the same scale as that of her brother Edward. She was herself a performer on the lute and virginals. Ecclesiastical music during her reign was again done with Latin words; but the science does not seem to have made much progress during the period that she was on the throne.

QUEEN ELIZABETH.

Choral music and music generally was much practised and cultivated during the long and prosperous reign of Queen Elizabeth. The Queen was very fond of music, and accustomed to sing and play on the lute, virginals, &c. Sir James Melvil gives an amusing account of a conversation he had with her in 1564, when ambassador from Mary Queen of Scots:—"After her Majesty had asked him how his Queen was dressed? What was the colour of her hair? Whether that or hers was best? Which of them two was fairest? and which of them was highest in stature? Then she asked, what kind of exercise she used? I answered, says Melvil, that when I received my dispatch the Queen was lately come from the Highland hunting; that when her more serious affairs permitted she was taken up with reading of histories; that sometimes she recreated herself in playing upon the lute and virginals. She asked if she played well? I said, 'reasonably for a Queen.'

"The same day, after dinner, my Lord of Hunsden drew me up to a quiet gallery, that I might hear some musick (but he said that he durst not avow it), where I might hear the Queen play upon the virginals. After I had hearkened awhile, I took by the tapestry that hung before the door of the chamber, and seeing her back was toward the door, I entered within the chamber and stood a pretty space, hearing her play excellently well. But she left off immediately, so soon as she turned about and saw me. She appeared to be surprised to see me, and came forward, seeming to strike me with her hand; alledging she used not to play before men, but when she was solitary, to shun melancholy. She asked how I came there? I answered, as I was walking with my Lord Hunsden, as we passed by the chamber door, I heard such a melody as ravished me, whereby I was drawn in ere I knew how; excusing my fault of homeliness, as being brought up in the court of France, where such freedom was allowed, declaring myself willing to endure what kind of punishment her Majesty should be pleased to inflict upon me for so great offence. Then she sat down low upon a cushion, and I upon my knees by her; but with her own hand she gave me a cushion to lay under my knee, which at first I refused, but she compelled me to take it. She enquired whether my queen or she played the best. In that I found myself obliged to give her the praise." (*Burney*, Vol. 3, p. 14.)

Burney says that if the Queen was able to execute any of the pieces in a MS. which goes by the name of *Queen Elizabeth's Virginal Book*, she must have been a very great player. It has been imagined, too, that Elizabeth was a performer on the violin, and also on an instrument something like a lute, but strung with wire, and called the "poliphant," or "polyphon." A violin, of singular construction, with the arms of England and the crest of Dudley, Earl of Leicester, engraved on it, was purchased at the sale of the late Duke of Dorset's effects; the date of its make, 1578. It is very curiously carved, but the several parts are so thick and loaded with ornaments

that it has not more tone than a mute, or violin with a sordine; and the neck, which is too thick for the grasp of the hand, has a hole cut in it for the thumb of the player, by which the hand is so confined as to be rendered incapable of shifting, so that nothing could be performed on "this instrument but what lies within reach of the hand in its first position. The instrument is at present the property of Mr. Bremner, music printer, in the Strand. It is from the arms and crest that are engraved upon it that conjecture has made Queen Elizabeth its original possessor." (*Burney*, Vol. 3, p. 15, 16.)

The musical instrument thus described by Dr. Burney is now in the possession of the Earl of Warwick, and may be seen in the Loan Court of the South Kensington Museum, the Earl having sent it there for public exhibition.

Among the Sloane collection of MSS. preserved in the British Museum, there is one (No. 1,520) which contains a list of the musical establishment of Queen Elizabeth about the year 1587. It is as follows:—

Musytyons.			
The servant (fee)	£24	6	8
Trompeters, 16, fee to every of them	24	6	8
Lutes, Harps, and Singers.			
Chief luter (fee)	40	0	0
Chief harper	20	0	0
Rest of the luters	19	0	0
The other of two harps	9	0	0
And	8	0	0
Bagpiper (fee)	12	13	4
Minstrells, 9, whereof 7 at	18	5	0
One at	24	6	0
And the other at	66	0	8
Six children to sing.			
Rebeck, 2 (fee)	28	6	6
Sackbutt, 6, whereof 5 having by the year	24	6	8
And one at	36	10	0
Vialls, 8, whereof 6 at	30	8	4
One at	20	0	0
And thother at	10	0	0
Players on the virginalls, 3, one at	50	0	0
And thother 2, at a piece	30	0	0
Musitions straungers, 7, whereof 6 have	30	10	0
And one	38	0	0
Drumsleds, 3, every of them	18	5	0
Players on the flute, 2, at a piece	18	5	0
Makers of instruments { Regal maker	20	0	0
Makers of instruments { Organ maker	20	0	0
Players of interludes, 8, every of them per annum	66	0	8

The Chapel establishment was nearly the same as that which existed in the previous reigns of Mary and Edward the Sixth.

Neal, in his *History of the Puritans* (p. 156), says that the service of her (Queen Elizabeth's) chapel was not only sung with organs, but with other instruments, such as cornets, sacbuts, &c., on festivals. In 1599 she published injunctions for the clergy, in the 49th of which there is one for choral music (Heylin, *Ecclesiast. Hist.*, p. 289).

In the Chapter-house at Windsor there is the following warrant of Queen Elizabeth:—

Eliz. R. Whereas our Castle of Windsor hath of old been well furnished with singing men and children—We, willing it should not be of less reputation in our days, but rather augmented and increased, declare that no singing men or boys shall be taken out of the said chapel by virtue of any commission, not even for our household chapel. And we give power to the bearer of this *to take any singing men or boys* from any chapel, our own household and St. Paul's only excepted. Given at Westminster the 8th day of March, in the second year of our reign.—Elizabeth R.

The prosperous reign of Queen Elizabeth was perhaps not rendered more illustrious by the musical productions of Tallis, Bird, and Morley, than the performance of Dr. John Bull, whose abilities on the organ and virginal seem to have been truly wonderful. This great musician was born about 1563, in Somersetshire; in 1591 was appointed organist of the Chapel Royal; and in 1596, at the recommendation of her Majesty, had the honour of being the first that was appointed music-professor to Gresham College; and though unable to compose and read his lectures in Latin, according to the founder's original intention, such was his favour with the Queen, that the executors of Sir Thomas Gresham, by two ordinances bearing date 1597, dispensed with his knowledge of the Latin language, and ordered, "The solemn musick lecture to be read twice every week, in manner following, viz.: the theoretique part for one half hour or thereabouts, and the practique, by concert of voice or instruments, for the rest of the hour, whereof the first lecture should be in the Latin tongue, and the second in English. But because at this time Mr. Doctor Bull, who is recommended by the Queen's most excellent Majesty, being not able to speak Latin, his lectures are permitted to be altogether in English, so long as he shall continue in the post of lecturer there." (*Burney*, vol. iii., p. 106.)

Instrumental music was, however, in a very low state during this reign. Henzner, in his Itinerarium, says that she (Queen Elizabeth) used to be regaled during dinner "with 12 trumpets and 2 kettle-drums, which, together with fifes, cornets, and side-drums, made the hall ring for half-an-hour together."

Vocal music had made great advances; and the church music, madrigals, and songs in parts of our countrymen during that reign, may bear comparison with the best contemporary productions of the continent. (*Burney.*)

James I.

Anthems, masques, songs, madrigals, and catches seem to comprise the vocal music of this reign for the church, stage, and chamber. Instrumental music made but little advance. The king does not seem to have derived any pleasure from music, though the separate music establishments of himself and Prince Henry were kept up in good state. But no records appear to exist to prove that the court took any direct interest in promoting and encouraging music.

Charles I.

In the second year of this reign (1626), *Nicholas Lanier* was appointed Master of the King's Music. The charter appointing him may be found in Rymer's *Fœdera*, Vol. 18, p. 728, and is directed to the treasurer and under-treasurer of the Exchequer. It recites, "Whereas we have been graciously pleased, in consideration of service done and to be done unto us, by sundrie of our musicians, to graunt unto them the severall annuities and yearly pensions hereafter following (that is to say) to Nicholas Laniere, master of our musick, two hundred poundes yearly for his wages;" and to seventeen others (named) various annual sums from twenty to eighty pounds a year.

The King constantly bestowed his attention and favour on the choral services of the church, and vocal music was greatly encouraged in his reign. But the court of Charles seems to have much indulged in the amusement of masques, in which music played a very important part. The four Inns of Court combined together and gave a masque of great magnificence to the King and his court at Whitehall during Christmas (1633). The cost of this masque to the four societies was upwards of £20,000.

In the eleventh year of his reign Charles I. granted a charter to the most eminent musicians of his time then living, incorporating them by the style and titles of "Marshal, Wardens, and Cominality of the Arte and Science of Musick in Westminster." As before stated, the charter of the 9th of Edward IV. formed the groundwork and precedent of this of Charles I. The powers and privileges granted by it extended throughout England, the county Chester only excepted, and in favour of the ancient

claim of the Dutton family to sovereignty over the minstrels of that palatinate.

In 1643 the cathedral service was suppressed, and the art of music wholly discouraged. During the rebellion and interregnum, musicians who held offices and had employment about the Court were forced to skulk about the country, and solicit aid and an asylum from private patrons. (*Burney.*)

Music at Oxford during the Protectorate.

Anthony Wood, or A Wood, was born at Oxford in 1632. In his Life, written by himself, occurs the following:—"All the time that A. W. could spare from his beloved studies of English history, antiquities, heraldry, and genealogies, he spent in the most delightful facultie of musick, either instrumental or vocal; and if he had missed the weekly meetings in the house of W. Ellis, he could not well enjoy himself all the week after. Of all or most of the company, when he frequented that meeting, the names are set down under the year 1656. As for those that came in after, and were now performers, and with whom A. W. frequently played, were these:—Charles Perot, M.A., Fellow of Oriel Coll., a well-bred gentleman, and a person of a sweet nature; Christ. Harrison, M.A., Fellow of Queen's Coll., a maggot-headed person and humorous; Kenelm Digby, Fellow of Alls. Coll., he was afterwards Dr. of L., he was a violinist, and the two former violinists; Will. Bull, M.A., for the viol and violin; John Vincent, M.A., a violist; Sylvanus Taylor, Fellow of Allsoules Coll., violist and songster, his elder brother, Capt. Silas Taylor, was a composer of musick, played and sung his parts; Henry Langley, M.A., a violist and songster; Sam. Woodford, M.A., a violist; Franc. Parry, M.A., a violist and songster; Christ. Coward and Henry Bridgman, both Masters of Arts; Nathan Crew, M.A., a violinist and violist, but alwaies played out of tune, as having no good eare, he was afterwards Bishop of Durham; Matthew Hutton, M.A., an excellent violist; Thom. Ken, of New Coll, afterwards Bishop of Bath and Wells, he would be sometimes among them and sing his part; Christ. Jefferyes, a junior student of Ch. Ch., excellent at the organ and virginals, or harpsicon, having been trained up to those instruments by his father, George Jefferyes, organist to King Charles I., at Oxon. Richard Rhodes, another junior student of Ch. Ch., a confident Westmonasterian, a violinist to hold between his knees.

"These did frequent the weekly meeting, and by the help of public masters of musick, who were mixed with them, they were much improved. Narcissus Marsh would come sometimes among them, but seldom played, because he had a weekly meeting in his chamber, where masters of musick would come, and some of the company before mentioned. When he became principal of St. Alban's Hall, he translated the meeting thither, and there it continued, when that meeting at Mr. Ellis's house was given over, and so it continued till he went over to Ireland, where he became afterwards Archbishop of Tuam. After his Majesty's restoration, when the masters of musick were restored to their several places that they before had lost, or gotten other preferment, the weekly meetings at Mr. Ellis's house begun to decay, because they were only held up by scholars who wanted directors and instructors. So that these meetings were not continued above two or three yeares, and I think they did not go beyond 1662."

The Oxford annalist terminates his account of the musical transactions of the University during the Interregnum by this anecdote:—

"In Oct., 1659, James Quin, M.A., and one of the senior students of Ch. Ch., a Middlesex man borne, but son of Walter Quin, of Dublin, died in a crazed condition. A. W. had some acquaintance with him, and hath several times heard him sing with great admiration. His voice was a bass, and he had a great command of it. 'Twas very strong and exceeding trouling, but he wanted skill, and could scarce sing in consort. He had been turned out of his student's place by the visitors; but being well acquainted with some great men of those times that loved musick, they introduced him into the company of Oliver Cromwell, the protector, who loved a good voice and instrumental musick well. He heard him sing with very great delight, liquored him with sack, and in conclusion said: Mr. Quin, *you have done very well, what shall I do for you?* To which Quin made answer with great compliments, of which he had command with a great grace, *that your highness would be pleased to restore him to his student's place;* which he did accordingly, and so kept it to his dying day."—*Burney*, vol. 3, pp. 428–30.

Charles II.

"The restoration of monarchy," says Burney, "and religious establishments drew from their retreats all the surviving musicians who had been degraded and involved in the calamities occasioned by the civil war."

In the year 1663 Charles II. augmented the salaries of the gentlemen of the Chapel to £70 a year, and granted £30 a year for the diet, lodging, washing, and teaching of the children of the Chapel Royal. Also "every gentleman of the Chapel in orders had allowed to him for a gown five yards of fine scarlet, and the rest of the gentlemen, being laymen, had allowed unto each of them foure yards of the like scarlet." According to Burney, the reign of Charles II. was more favourable to the progress of our native church music than any other, except that of Queen Elizabeth.

The charter granted by Charles I. to the musicians of Westminster having lain dormant till the Restoration, the persons named in it, and still living, made an effort to re-establish its provisions, and rescue music "from the disgraces into which it had fallen." The Corporation hired a room in Durham-yard, in the Strand, and their first meeting was 22nd October, 1661, Nicholas Laniere being Marshal; from which day they proceeded to make orders, summoning, fining, and prosecuting all who dared to make any benefit or advantage of "Musique in England or Wales" without first taking out a license from their fraternity.

The original minutes of the proceedings of this corporation still exist and are preserved in the British Museum. (*Harleian* MSS., No. 1911). The last entry is dated the 20th July, 1679, and is of a court holden at "ye 3 tunn tauorn;" "When," says Burney, "finding themselves involved in law-suits and incapable of enforcing the power they assumed and penalties they threatened, it was thought most advisable to leave the art and artists to the neglect or patronage of the public."

The succeeding reigns of James the Second, and William and Mary are not marked by any special advance in the support and progress of music, though remarkable as the period that produced Henry Purcell.

Royal Academy of Music.

In 1720 a plan was formed for patronising, supporting, and carrying on Italian operas. A fund of £50,000 was raised by subscription, George the First giving £1,000. This plan or establishment was called the Royal Academy of Music, and consisted of a governor, deputy-governor, and 20 directors. The Duke of Newcastle was governor the first year, Lord Bingley deputy-governor, and the directors were the Dukes of Portland and Queensberry, the Earls of Burlington, Stair, and Waldgrave, Lords Chetwynd and Stanhope, Generals Dormer, Wade, and Hunter, Sir John Vanbrugh, Colonels Blathwayt and O'Hara, James Bruce, Thomas Cole, of Norfolk, Conyers D'Arcy, Bryan Fairfax, George Harrison, William Pulteney, and Francis Whitworth, Esqrs. "And in order to render this design as complete as possible, it was determined by the directors not only to engage a lyric poet in their service, but the best vocal performers that could be found in the several parts of Europe where there was a musical theatre, and the three most eminent composers then living who could be prevailed on to visit this country.

For this purpose Bononcini, as he tells us himself, had been invited hither from Rome; Altilio Ariosti, from Berlin; and Handel, who resided at this time with the Duke of Chandos, at Cannons, was not only included in this triumvirate, but commissioned to engage the singers. And with this view he went to Dresden, where the elector of Saxony, Augustus, then King of Poland, had Italian operas performed at his court in the most perfect and splendid manner possible; and here Handel engaged Senesino, Berenstadt, Boschi, and the Durastanti." (Burney, vol. iv., p. 258.)

The last opera performed under the auspices and direction of the Royal Academy of Music was Ptolomy (*Tolomeo Re d'Egitto*). The £50,000 originally subscribed for its support seems to have been sunk in less than seven years, besides the money obtained by the sale of tickets, and that taken at the doors for the admission of the general public.

Burney says that "the governor and directors of the Royal Academy of Music, after the sum originally subscribed for its support was expended, relinquished the idea of entering into new engagements for amusing the public at their own expense. Indeed, either from the difficulty of finding a sufficient number of subscribers that were willing to involve themselves in so costly and hazardous an enterprise, or from an opinion that the opera being no longer in an infant state, was now robust enough to go alone, it appears by the bills and advertisements that there were no annual subscribers in 1727, but its whole maintenance and support depended on the original subscribers and public favour. Whether the feuds which so long agitated the critics and patrons of music, concerning the abilities of Handel and Bononcini, and of Faustina and Cuzzoni, precipitated the dissolution of the Royal Academy, or the disagreement between Handel and Senesino, cannot now be easily determined. Perhaps all these causes conspired to relax discipline and to tire the public; for though zeal and attention were at first stimulated by these debates, yet they seem to have been succeeded by disgust and indifference. At the close of this season the whole band of singers dispersed, and the next year we find Senesino, Faustina, and Baldi performing in one theatre in Venice, and the Cuzzoni, with Nicolini, Farinelli, and Boschi, at another, in the same city.

"On the 15th of May a general court was summoned of all the subscribers to the Royal Academy of Music, and on the 16th notice was given in the same paper, 'that the general court of the Royal Academy of Music stands adjourned till eleven o'clock on Wednesday next, the 22nd instant, in order to receive any further proposals that shall be offered for carrying on the operas.' Another meeting, by adjournment, on the 29th. On the 31st 'the general court of the Royal Academy of Music stands adjourned till eleven o'clock on Wednesday the 5th of June next, in order to consider of proper measures for recovering the debts due to the Academy, and discharging what is due to performers, tradesmen, and others; and also to determine how the scenes, clothes, &c., are to be disposed of if the opera cannot be continued. N.B.—All the subscribers are desired to be present, since the whole will be then decided by a majority of votes.' Nothing further appeared in the newspapers concerning the Royal Academy of Music till December 2nd, when the following advertisement was inserted in the *Daily Courant*:—'The time appointed by the charter of the Royal Academy of Music for choosing a deputy-governor and directors of the said Academy being on the 22nd of November in each year, or within fourteen days after, notice is hereby given that a general court, by order of the governor of the said Academy, will be held at twelve o'clock on Friday next, being the 6th inst., at the usual place in the Haymarket.' Whether the court ever met, or any measures were taken in consequence of the advertisement, does not appear.

"In the autumn of this year, and the spring of the next, the opera house was shut up, and the musical drama suffered to lie fallow."—*Burney*, vol. 4, pp. 337-9.

WILLIAM MATCHWICK.

THE NEW GRAND OPERA HOUSE OF PARIS.

The works of the new opera are proceeding gradually but sufficiently rapidly for the proposed inauguration, on New Year's Day, 1869. The sum said to be devoted to the purpose is one million sterling, of which three-fifths, if not more, have already been expended. It would perhaps be a little hazardous to say that there will not be required a certain postcript to the estimates. The employment of the twenty-five millions of francs is thus apportioned:—For iron work, two millions; marble, eight millions; sculpture, and other works of art, fifteen millions. Of course this is but a rough division.

The paintings in the interior are to be entrusted to MM. Baudry, Boulanger, Barrias, Delaunay, Gérôme, and Pils. It is said that the designs for these internal decorations, which have been submitted to the judgment of M. Garnier, the architect of the work, amount to several thousands in number.

The list of the statues and busts which are to decorate the exterior of the building and the vestibule is published officially. On the principal façade, in the tympans of the arcades of the main entrance will be medallions of the composers, Cimarosa, Pergolesi, Bach and Haydn. In the grand vestibule four seated statues of the four chiefs of the schools of Italy, France, Germany, and England—Lulli, Rameau, Gluck, and Handel.

In the seven *œils de bœuf*, or small circular windows, are to be seven bronze busts, gilt; the centre will be that of Mozart, born 1756, and those of the other composers will be placed on each hand according to the dates of their birth; thus to the right of Mozart will be Beethoven, born 1770; Auber, 1782; and Rossini, 1792; and on the left Spontini, 1774; Meyerbeer, 1794; and Halévy, 1799. On the return of the façade busts of two librettists—Quinault and Scribe. On the two lateral façades are to be placed twenty-four busts in chronological order. On one side Monteverde, Durante, Jomelli, Monsigny, Gretry, Sacchini, Lesueur, Berton, Boieldieu, Herold, Donizetti, and Verdi; on the other Cambert, Campra, Jean Jacques Rousseau, Philidor, Piccini, Parsiello, Cherubini, Méhul, Nicolo, Weber, Bellini, and Adam. In one of the foyers are to be placed busts of celebrated architects, or others connected with opera.

Amongst the sculptors employed are M. Carpeaux, whose fronton for the *Pavillon de Flora* of the Tuileries has attracted so much well-deserved admiration, and which we have mentioned in our notes on the late Paris Salon, M. Denecheaux, and M. Bruyer.

Amongst the reports afloat respecting the decoration of the interior is one to the effect of M. Meissonnier having made proposals for departing from his micrographic style and executing colossal works on the walls of the salon in the rear of the Emperor's box. Another *on dit* is that this room will be so spacious that, in case of necessity the Emperor might give audiences, or hold a council of Ministers between the acts.

As regards the dimensions of the new opera house, the following are said to be exact. The stage is in all more than 165 feet in height, the space being divided equal between the stage proper and the spaces below and above, giving 55 feet to each. The size of the stage will be nearly 170 feet wide and about 114 deep. The principal boxes will have behind each an anti-chamber three times the size of the box itself; and the passages behind the boxes will be twenty feet wide. The immense importance of wide passages in theatres and all large public buildings, not only with respect to comfort and ventilation, but also as means of escape in case of fire or panic of any kind, cannot be too often insisted on. No one who contemplates building a new theatre,

specially for popular entertainments, should fail to visit the new Chatelet Theatre in Paris; the passages and lobbies of this beautiful theatre are large enough to drive a brougham along, and even in parts to turn it round, and the staircases are in keeping with these magnificent proportions. Another feature deserving attention in the same building is the fine public foyer, or saloon, with its terrace overlooking the Place du Châtelet and the Seine. The plans of the new opera-house hold out the expectation that in the matter of entrances, public and special staircases, vestibules, lobbies and corridors, the new theatre will surpass any now in existence. The Emperor's entrance has a covered arcade, so that the Imperial carriages may set down under shelter, in fact almost within the house itself.

ADULT EDUCATION IN FRANCE.

The subject of adult education has received great attention of late, and a circular, addressed by the Minister of Public Instruction to the prefects, puts us in possession of the facts connected with the movement.

It appears that between November and March last nearly 25,000 courses of instruction for adults were given in France; that the number of persons who attended them amounted to about 600,000; and that the teachers numbered 30,000 of all classes, male and female. The Minister says that by these means 250,000 illiterate persons have learned to read, write, and cipher.

Out of the 600,000 persons attending the classes, 7,000 paid for their instruction, altogether, 415,000 francs (£16,600); while 15,375 courses of instruction were entirely gratuitous, and 14,409 teachers gave their services without remuneration. The expenses have been met by subscriptions from 3,500 communes—about the tenth of the whole of France—amounting in the whole 650,000 francs (£26,000); from private individuals, 5,000 francs; from the conseils-généraux, 72,000 francs; and by disbursements by teachers themselves for the same object, 91,000 francs; making a gross sum nearly forty thousand pounds.

The teaching of adults, says the Minister, is now established in France, but no one can think for a moment allowing teachers to continue double their labours without remuneration, and to put themselves to expense besides. The sum originally devoted by the government for adult education was 60,000 francs; this was raised to 110,000 francs for the present year, and will be increased to 150,000 francs for 1867. But this will be far below the required amount, and therefore the Minister calls upon the communes to defray the expenses of fire and lighting, and to find means for the payment of the teachers when the courses are gratuitous. The adult classes, adds the Minister, double the number of schools with almost no cost; they render fruitful the outlay for primary education, thus drawing from the same capital double interest. There is no doubt that the conseils-généraux and other local bodies will answer the appeal made by the Minister; and if the work of adult education is pushed on with zeal for a few years the position of France as regards education will be materially altered.

PUBLIC MONUMENTS IN BELGIUM.

The Belgian authorities exhibit a most praiseworthy regard for their public works of art and monuments. A central commission is entrusted with their keeping and also with the consideration of all questions, theoretical as well as practical, touching their preservation. The report of the proceedings of this commission, embracing rather more than twelvemonths' labour, has recently appeared, and deserves attention.

It appears that the commission has more than twelve hundred subjects before them; that the project for the restoration of public works presented to them included nearly two hundred; and that the works undertaken in consequence absorbed nearly £120,000. In addition to this the commission had to examine more than two hundred other projects for new buildings, and a still larger sum was expended on that account. The funds to meet these expenses were contributed partly by the Government and partly by local authorities.

The report refers to the efforts made by the commission to clear away all buildings abutting on churches, as a precautionary measure, as well as in the interest of art. It was found on inspection that the inhabitants were in the habit of cutting away buttresses, undermining walls, and injuring foundations by the sinking of wells.

Under the head of the decoration of religious edifices the report mentions the discovery in many churches of old mural paintings, covered up for long years beneath coats of paint or whitewash. Extensive decorations are proposed to be executed in old buildings; and amongst others the church of St. Jacques-sur-Caudenberg is to be commenced next year. Amongst other useful services done or proposed to be done, are the creation of a special atelier, under the auspices of the Government, for the restoration of ancient paintings, the formation of a complete catalogue of the works of art existing in public buildings, and the repair of the old gates of the town of Antwerp.

An interesting portion of the report is that which records the discussion by the members of the commission of several important questions submitted to it by provincial committees in communication with the central body. The Committee of Brabant proposed, first, that every artist submitting a plan for the restoration of a public monument should be required at the same time to furnish a memoir in support of his proposal; and, secondly, that in the case of new buildings the commission should confine itself solely to the consideration of the estimates and the solidity of the construction, leaving the entire responsibility, in an artistic point of view, with the artist himself. It is not surprising that the novelty of the propositions should have met with considerable opposition, and that the opinion of the majority was averse to both; it being argued against the latter that the commission, in renouncing all control over the esthetic value of the plan submitted to it, would be giving up it most important prerogative. It should be mentioned that the commission is only empowered to discuss the subjects submitted to it, the decision being left to the Government.

Another proposition was that a series of general instructions should be drawn up on the restoration and preservation of public monuments, and transmitted to all the administrations charged with such duties. This subject was discussed at length. One member considered that the reproduction of the very complete instructions published in France by the Committee of Monuments would be all sufficient. In opposition to this it was argued that Belgium was in a peculiar archæological position; that she was, as it were, at the confluence of various styles, and the restoration of many of her monuments would present many points which had not been provided for in the French instructions; that many excellent architects were not archæologists; and it would be useful therefore to establish certain general rules for the restoration of monuments in different styles; the architect who planned a new building should be left absolutely free, but it was not so when the restoration of an ancient monument was in question; in such a case his duty was to conform rigorously to the idea of the author of the work. The opponents of the proposition argued that architects were already far too much trammelled, and that, with the exception of the material parts of the construction, no general rules could be laid down. The only useful instructions would be such as were given to the architect in each individual case. On the other hand it was urged that the intention of the

proposal was not to interfere with the independence of architects. The instructions would not be for them alone but for local administrations, for ecclesiastical authorities, and for all those who are occupied, directly or indirectly, with the preservation and restoration of public monuments.

A proposal was made for the establishment of a central school of architecture at Brussels, but it was opposed upon the ground that such a measure would tend to diminish the attention paid to architecture in the academies, and to centralize the study. Other members of the commission, on the contrary, agreed with what had recently been done in France on this head, and supported the proposition as tending to strengthen architectural teaching, which in the academies was very incomplete.

Several questions set down for discussion on the programme of the commission itself were of general interest. The first was:—Whether, in order to preserve archæological traditions in all their purity, a distinction should be drawn in certain cases between ancient monuments and additions which have been made to them at various times. It was stated, in a memorandum attached to the question, that the new portions of buildings erected in past ages, were distinguished from the older parts, in consequence of the general practice of completing an edifice in the style in use at the time of such additions, without consideration of the original style of the building. This statement was contested, and instances were quoted in which the new portions of ancient buildings had been built in the style of the original epoch. The result of the discussion was to draw forth an admission that the statement appended to the question had been couched in terms too absolute, and that certainly if, in past times, architects entrusted with the completion or extension of buildings conformed to the original style, such practice was quite exceptional; in far the greater number of cases, the new constructor took no heed of the older parts.

Another question set down for consideration was—In what case may an artist, in decorating a mediæval edifice, either by painting or sculpture, give to his figures costumes differing from those of the epoch to which the edifice belonged? It was asserted, on the one hand, that the figures might be dressed in the costumes which they really wore; and, on the other, that the costumes should be those of the time of the erection of the edifice, no matter when the persons represented may have lived. The commission, however, adopted the following view of the case:—That there were distinctions to be made as to the course to be taken, which could not be stated in absolute terms; when the work to be done was the addition of new to ancient statues, in order to complete the sculptural decoration of an edifice, it was the duty of the artist to reproduce even the anachronisms committed by the ancient artists, but that in the case of edifices having no sculpture, or of new buildings, the costumes adopted should be those of the time in which the personages lived.

The fourth question set down for consideration had reference to the duty of the Government as regards the preservation of private houses presenting a public interest, either in an artistic or historical point of view; but as the Belgian Government had already taken the initiative in this matter, the subject was allowed to drop.

The remaining question was whether an architect entrusted with the restoration of a building should be specially remunerated for drawings of the building in its former condition, in order that the State might become possessed of such drawings, which might be engraved and published on a uniform plan. This interesting subject was, however, adjourned to next year.

The discussion of subjects touching so intimately the preservation of the edifices and works of art of past ages shows how lively is the archæological sentiment in Belgium.

Fine Arts.

The Louvre.—Visitors to Paris this autumn a[nd] during the year of the International Exhibition will f[ind] remarkable changes in the Louvre; several new g[al]leries have been opened, or are now under the hand[s of] workmen or decorators, and some will be opened to [the] public in a short time. One of the principal departme[nts] of the museum, that of Antiquities, is being comple[tely] renovated. M. Balze is entrusted with the work of [re]storing the frescoes, painted by Romanelli, in 16[..,] which decorate four of the salons of this portion of [the] gallery. In a fifth salon of the same department—t[hat] known as the Salon of the Emperors—another ar[tist,] M. Matout, is painting the ceiling, which is upwards [of] fifty feet long; and M. Biennoury is decorating [the] vaultings with paintings in cameo. A new and v[ery] fine room is now being finished in the new portion [of] the building, the Pavillon Denon, which will form [a] new and very convenient entrance to the museum; i[t is] being decorated with paintings and sculpture, and [will] form one of the richest salons in the whole gallery. [It] will contain the great works of the old masters of [the] French school:—Lebrun, Lesueur, Poussin, and J[ou]venet. When the Salle des Etats, now being c[on]structed in that end of the grand gallery which c[on]nects the Louvre with the Tuileries is completed, [the] chamber used at present for the meeting of the Emp[eror] and the two legislative chambers, will be added to [the] long range of galleries occupied by paintings. [The] great vase of Amathonte has been placed in the gal[lery] of Egyptian Antiquities, to which, although it g[ives] additional interest, it adds nothing in appearance; [its] huge dimensions and great antiquity form its clai[m to] attention. The Gallery of the Sovereigns is b[eing] enriched with some curious specimens of painted g[lass,] principally Swiss; and the Gallery of Ancient Te[rra]cottas has received some additions. Great progres[s has] also been made in the series of annotated and il[lus]trated catalogues of the special sections of the Mu[seum,] which add much to its educational value. The Lo[uvre] will be seen in 1867 in a condition worthy of [the] occasion.

The Tribulations of a Statue.—In the year 1[...] the French sculptor, David d'Angers, presented [the] Government of Athens with a statue for the tom[b of] the hero of the war of Greek independence, M[arco] Botzaris. The figure was intended as an imperson[ation] of regenerated Greece. A young girl, half reclining o[n] the marble, points to the name of the fallen h[ero.] Almost immediately after the statue was placed on [the] tomb it was sadly mutilated by a group of bandits, u[nder] the command of a man who, during the war, had be[en a] rival of Marco Botzaris. The vandals fired upon [the] tomb until they had succeeded in knocking off the [...] hands, ears, and some portions of the drapery. [The] statue remained in this terribly dilapidated condi[tion] until the year 1863, when it was sent to Paris by [the] Greek Government, who requested the family of [the] famous sculptor to have it restored with all po[ssible] skill. David d'Angers has left a son, if not more t[han] one, but his art has not descended upon his childr[en;] therefore M. Allasseur, his most distinguished pupil, [was] selected for the task of restoration, which he is said [to] have performed with great skill. The work has b[een] completed for some time, but, from some unexpl[ained] cause, instead of being replaced on the tomb of the h[ero,] the statue still remains in Paris. The late pol[itical] changes in Athens may have placed some difficulty [in] the way; but it is not to be supposed that the Gover[n]ment of Athens will allow the record of Greek in[de]pendence, now that the work of the Vandals has b[een] repaired, to remain long in the French capital.

Manufactures.

China Grass.—The fibres of varieties of this nettle plant vary considerably in strength and fineness, growing generally to eight feet or more in length, according to climate and soil. They are capable of being easily cleansed from loose vegetable matters, so as to produce long filaments, which, for fabrics requiring excessive strength, would be much superior to flax or hemp. In comparison with those fibres, however, in the same state of preparation, the filaments are rough and coarse, consequently less adapted for light uses. Its highest value is attained in a state of separated cells, varying from three to eighteen inches in length, of surprising wiry toughness and brilliancy when properly cleansed and uninjured by preparation; of good colour, requiring little or no bleaching. In this state it has now come into acknowledged use, although as presented on the market the fibre is much impaired and imperfect. As it is in appearance, fineness, and length very similar to mohair and lustre wools, it seems well adapted for mixing with them, or for forming warps for lustre wefts. For mixing with silk fibres its utility is now doubtful, as it is much coarser and stiffer; yet, as a weft yarn for silk warps it appears adapted to form cloths of great beauty. Nor need want of colour be here a drawback, as it is capable of being dyed in apparently permanent colours of a full rich red, violet, and blue. There is little doubt that, from the fibre so separated, European manufacturers could produce cloth exceeding in fineness and evenness, and consequently in beauty and brilliancy, the famed grass cloths of China. These cloths might not be so fine, nor could they be more brilliant, than a flax cambric can be produced, but they would possess a glassy stiffness (so opposed to the tendency of flax to become linty) which would command for them a high appreciation and value. The use of China grass in this state for fancy trimming is apparent, as well as for many fabrics for ladies' dress, and for some upholstery cloths, probably; also for superior fancy drills, it would produce goods highly appreciated on the Continent and in warm climates. It is noticeable that in separating this fibre, the lustrous coat of each cell is so thick that when the outer portion of it (which is organic) is left intact, with all its natural brilliancy, the cell is perceptibly thicker, even to the naked eye, than it is as usually treated with this outer coat destroyed. It is attacked with unusual facility, as is also the strength of of the cell. The samples of this combed fibre at present found in commerce do not possess more than from one-third to two-thirds of their natural strength or length. But although the difficulty in preserving these is considerable, yet the total difficulties to be surmounted in bringing the fibre into this state are not so great as in most other fibres, and by the employment of reasonable means the cells may be obtained nearly of their natural length, strength, and brilliancy, accompanied with perfect separation. The relative actual value of China grass is high. Its present quoted price of £85 per ton may be called a fancy one. The trade cannot give it, and will not do so long, when it is producible with equal profit at as low a price as Bombay hemp itself. It is a forcible instance of the heavy *vis inertiæ* which hangs over everything not hackneyed in commerce, that such a valuable fibre, producible at so low a rate, and in illimitable quantities, should be so difficult to obtain, and at prices so fabulous; for the fibre, even if simply cleansed (by means within the reach of every one) for a strong rope, or coarse cloth filament, would be a valuable adjunct to our fibrous materials, in increasing demand at remunerative rates to the producer.

Paper Manufacture.—The value of the paper made in the United States in 1850 was £2,000,000, and in 1860 was £3,500,000; the value of books printed in 1860 was £2,370,000, and of newspapers, £4,130,000.

Sugar in North America.—The cane sugar made is about 300,000 hds. of 1,000 lbs. each, and molasses 17,000 gallons. Of maple sugar about 40 million pounds are made, and about 2 million gallons of molasses; of Sorghum molasses about 8 million gallons are made; of honey, 26 million pounds are obtained.

Ironfounding.—The value of the iron made in the United States in 1860 was 28½ million dollars, against 20 million dollars in 1850.

American Manufactures.—The value of the leading manufactures in 1860 was in round numbers as follows, in dollars:—Cotton goods, 115 millions; boots and shoes, 90 millions; leather, 72 millions; clothing, 70 millions; woollen goods, 69 millions; machinery and steam-engines, 47 millions; sugar refining, 38½ millions; iron-founding, 28½ millions; bar and other rolled iron, 22 millions; pig-iron, 19½ millions; cabinet furniture 24 millions; malt liquors, 18 millions; agricultural implements, 18 millions; soap and candles, 17 millions.

Commerce.

American Coal.—The quantity of coal produced in the United States in 1860 was 15,551,000 tons, of which 9,416,340 was anthracite, and 6,134,660 bituminous. Pennsylvania produced 45·8 per cent. of the quantity of bituminous coal.

Spanish Wool.—Our imports of sheeps' wool from Spain have been gradually decreasing. In 1860 we received over one million pounds, and last year but 115,611 lbs.

Rice in America.—Sir S. Morton Peto, in his work on the resources and prospects of America, says:—"The cultivation of rice is limited to a very few slave states. South Carolina and Georgia produced in 1860, 171,000,000 lbs. out of the total produce of all the States, which amounted to 187,000,000 lbs. In 1820, South Carolina and Georgia produced 198,881,000 lbs., and the total product of the States in that year exceeded 215,000,000 lbs. Rice, therefore, which in America is a product peculiar to the slave states, is a declining cultivation."

Tea Culture in India.—Some efforts have recently been made (say Messrs. Travers) by the Government of India to procure information on the subject of tea-culture from the planters themselves; and though the attempt has not been wholly unsuccessful, it is disappointing to find that these efforts have not been seconded by a corresponding readiness in the planters to afford the necessary returns. The Government of Bengal, anxious to include in the Annual Administration report some reliable information on the cultivation of tea in Assam and Cachar, had given instructions to the commissioners of the districts in question to furnish an annual report on this particular article. Blank forms were accordingly printed, to be filled up with the names of the tea-gardens, the extent of the land under cultivation, the out-turn of tea in the present and past seasons, the relative proportion of European and native assistants, the average monthly number of labourers employed during the year—men, women, and children—with any remarks having relation to the out-turn or any other subjects connected with the return. With complete answers to these queries the actual state of the cultivation would be realised at once. The planters, however, appear to have regarded the inquiry as an arbitrary and inquisitorial proceeding on the part of the Government, and in many instances actually refused to make the required return. In the Seebsagur district alone, out of 139 proprietors of tea estates who were asked to fill in the forms, only twenty complied with the request; and one of the managers, the commissioner reports, sent back his returns, stating that "he had no time for such matters." In the Nowgong and Durrung districts, either the information given was of so meagre a character as to be practically useless, or the planters declined to answer. The only three places where anything

like accurate information was obtained, was Gowalpara, Kamroop, and Luckimpore. When an inquiry of a similar character was attempted to be made some time previously, the unwillingness of the planters to afford information was explained on the ground of their "often having no paper on which to make their returns, and partly because they were not prepared to incur the expense of the postage incidental to their transmission." It was for the express purpose of meeting these objections that blank forms were prepared, together with a franked envelope, in which they were to be returned after being filled in. However, even this plan has been found to be quite as unsuccessful as the former, and the commissioner, in his report to the Government of Bengal, asserts that even "fewer returns have been made this year than last year." "I believe," he adds, "that the reason is to be found in the altered conditions under which tea planting is now carried on in Assam; it is not alone the production of tea which is concerned, but the success of very extensive financial speculations which might be injuriously affected in many instances by disclosures." Under these circumstances the Government refers the matter to the Landholders and Commercial Association for their consideration; but their answer, whilst admitting the great public utility of such inquiries, appears to insist on the redress of some special grievances before they will concur with the Government in the proposed inquiry.

Beet Sugar and Cane Sugar.—The following is from *Travers' Circular*:—The astonishing progress made in late years by beetroot sugar is beginning to excite the greatest apprehension in the sugar growing colonies. It is of the greatest interest to consider the different points that are likely to cause the preponderance of the cane or of the beet. In the first place, the sugar cane is a denizen of the tropics, where the condition of the weather at any given time can be counted upon with certainty. The beet, on the other hand, grows in the temperate zone, where, although the inhabitants neither suffer from excessive heat nor excessive cold, the weather is almost always unsettled and more or less uncertain. The beet, which is affected by too much rain or by too little, by unseasonable heat, by unexpected cold, or by too little or too much sunlight, is particularly uncertain in its growth, and the remarkable fluctuations in the crops during the last few years sufficiently establish this point. In 1859-60 the beet crop amounted to 438,000 tons; in 1860-61 it amounted to only 366,826 tons; in 1861-62 it again rose to 404,411 tons; and in 1862-63 to 450,000 tons. The season 1863-64 was a bad one, and the return sank to 385,741 tons, from which it again rose in 1864-65 to 475,000 tons. This season it will probably amount to close on 600,000 tons. It must be remembered, in considering these very great fluctuations in returns, that, notwithstanding the extraordinary variation in yield, the breadth of land sown has steadily increased year by year, and that even the present season (the largest known) has been a favourable one only in France, while in Germany the weather was decidedly unfavourable, and in Russia so much so as to cause a failure of the crop. Although the beet crops will probably continue to increase, and although in a generally favourable season much heavier returns may be looked for, there is certainly some comfort for cane planters in the fact of the great uncertainty of the European plant. The beet owes its rapid spread over the Continent, in great measure, to its indirect use in agriculture. It gives a basis for the rotation of crops; its leaves and refuse are useful for cattle feeding and for manure. But, on the other hand, the indirect uses of the cane have never been tried, and its refuse, although full of saccharine matter, far from being made useful, is burnt. There is another advantage possessed by the beet in its being produced in the very countries where the sugar is wanted—thus saving the costly freight from the tropics. This certainly applies to countries in the interior of Europe, but countries having a seaboard, and which have to draw their supplies from the interior or from other European kingdoms, can frequently import sugar at nearly as cheap a rate as they can transport it. For instance, the latest quotations of freight from Mauritius to England is 30s. per ton, while to get sugar even from the north of France to London costs 25s. per ton; or, in other words, the carriage of sugar from Mauritius to England is only 3d. per cwt. dearer than from France to England. Thus, as far as freight is concerned, there is little fear, while the English market remains open, of cane sugar being shut out from consumption. It must, however, be expected, if the present state of things continue, that in a very few years the Continent will draw its supplies entirely from the beet, and also, that although England has as yet made no sugar from it, that the beetroot grows and thrives from John o' Groat's to the Land's End, and that a little more success on the Continent will cause the manufacture of native sugar to be introduced here. It remains to be seen whether cane sugar can recover the ground lost, but there can be little doubt, had proper use been made of their advantages, that the colonial planters would not have been so far behind in the race as they are at present. The scale of duties meant to protect certain colonies against the effect of their ignorance and wastefulness, had the effect of lowering the standard of sugar-making all through the tropics. Instead of trying to make the finest possible sugar, the planter tried to make the worst, and the wasteful process that had existed in only a portion of the colonies became general. In the meantime the ablest chemists, engineers, and agriculturists were silently studying the constitution of the beetroot. Every invention that could increase the saccharine yield of the root, facilitate its working, and improve the qualily of the sugar, was eagerly applied; the yield of sugar from a given quantity of beetroot has been doubled in ten years, and white sugar can now be made in France at the first operation as cheaply as brown. Should such progress induce cane planters to despair? On the contrary, it should stimulate them to exertion. Surely if the cane contain twice as much saccharine matter as the beet; if it be far more easily worked; if its growth can be more confidently relied on; if its molasses be a saleable article, which is not the case with the beet, surely we say that, far from despair, the feeling that should animate the planters should be that of hope that the proper appliances may yet rescue their industry from ruin. Every year that passes shows more indisputably the necessity for improving cultivation, for improving machinery, and for making the best instead of the worst sugar; and if cane planters will take advantage of their opportunity they may yet retrieve their position.

Colonies.

Salmon in Australia.—The *Times* correspondent at Melbourne, in a letter dated May 28th, says:—"The salmon has often been called "the king of fish," and certainly in Australia he receives right regal honours. For many days before the arrival of the *Lincolnshire* with the last consignment of salmon and trout ova, the vessel was anxiously looked for by our Acclimatisation Society. The Victorian steam sloop *Victoria* had been engaged weeks before for the carriage of the ova to Tasmania for deposit in the breeding ponds in the neighbourhood of Hobart Town. When the *Lincolnshire* did arrive in our bay, it was not long before our Salmonians were on board of her in force. The transhipment from the *Lincolnshire* into the *Victoria* took place on the 5th inst. It was a very solemn proceeding. As great officers of state may assemble in an ante-room on the birth of a Crown Prince, so the President of our Acclimatization Society, supported by a number of his fellows, superintended the interesting work. So admirable a provision for the safe carriage of the ova had

been made in the *Lincolnshire* that in a few of the boxes which were opened at least 80 per cent. were alive, and Mr. Ramsbottom, who is in charge of the shipment, confidently expects that 60 per cent. of the whole will be safely deposited in the breeding ponds. There were 140 boxes in all. We have since learnt from the Tasmanian newspapers that the precious shipment was received with at least equal honours and attention on the other side of the Straits, and, in the presence of various Government officers and enthusiastic naturalists, was landed, carefully carried to its destination, and finally consigned to the hatching boxes. The latest intelligence is that the ova had commenced hatching, and Mr. Ramsbottom pronounces this last shipment to be 'a great success.' Our acclimatizers deserve this success, for their hearts, stomachs, and pockets have been in this business for years. We are now beginning to look for the return of our earlier lots of young salmon from the sea to the river in which they were bred. Until the crowning results shall be distinctly ascertained we can hardly believe that salmon are perfectly naturalised in these regions, or that they are literally 'too many' and too active for the sharks and other natural enemies which are doubtless quite ready to welcome in their own way the new addition to our seas."

South Australia.—The population of this colony is now nearly 165,000. The agricultural statistics show a great falling off in the produce of last harvest, chiefly owing to drought. It, however, is beneficial to see that during the present month much more than the average quantity of rain fell, and this has greatly revived the hopes of all those who occupy or cultivate the land. Mining operations continue thriving, and there are indications not far distant of new discoveries both in copper and gold.

Statue of the Prince Consort at Sydney.—On the 23rd April the statue to the memory of the Prince Consort was inaugurated. The crowd who witnessed the ceremony formed the greatest demonstration that has ever taken place in the Australian colonies. St. George's day had not previously been devoted by unanimous consent to relaxation from business, but was on this occasion observed as a close holiday. The meeting was not one of representatives—it was a gathering of the people, rich and poor, literate and unlearned, to do honour to the memory of a prince who was the friend of all classes.

New Zealand Flax.—Many efforts have been made to render this a marketable article for export, but the difficulty has always been the removal of the gum from the fibre. A Sydney paper says that if the green leaves are boiled for about two hours in water mixed with a little manure from a cowshed the gum is completely absorbed, so that on washing in cold water the fibre is left clean and white. No damage appears to be done to the fibre by the process, which, of course, is one that can be put in practice by every settler's family up the country.

Notes.

The Printing Trade and the Factory Act.—It appears from the report of the Children's Employment Commissioners, recently issued, that there are in England 30,171 male, and 419 female, persons coming under the designation of "printers," and in Scotland 4,400 males and 70 females. Of the total of 30,590 so employed in England, 2,819 are under fifteen years of age; and of the total of 4,470 employed in Scotland, 593 are under that age. It is remarked in the report that overcrowded, ill-ventilated, dirty, and unhealthy composing-rooms, reading-closets, and machine-rooms, make up what is designated a printing-office. The excessive amount of overtime and nightwork are strongly spoken of in the report, and instances are given of boys between ten and thirteen years working thirteen hours and more at a stretch. The injurious effect of such work on the health is pointed out, and the report goes on to state that it appears that the following classes of persons are responsible for such a state of things:—"Editors of, and writers of articles in, magazines, weekly newspapers, and other weekly or monthly periodicals, who will not send in their contributions until the last moment. Cases are mentioned of editors not having in the evening completed the writing of articles for magazines that are to be printed off, bound and circulated the next day; railway officials, and other persons requiring guide-books, hand-bills, or other notices to be printed by a given day, who withhold their instructions until the evening before the day on which the printed matter is wanted; solicitors who send matter at six or seven o'clock in the evening which is wanted by nine o'clock the next morning; those who direct the publication of certain parliamentary documents, such as the votes, evidence taken before committees, and other matter requiring to be put into print by the next day." The Commissioners express the opinion that none of the excuses made for this state of things are of sufficient weight to induce the legislature to abstain from granting to the young and to females the valuable boon of the regulated hours of factory labour.

The Cycloscope.—At a meeting of the Institution of Civil Engineers, on the 15th May, Mr. H. Temple Humphreys, Assoc. Inst. C.E., exhibited and explained, with diagrams, an instrument called the cycloscope, for setting out railway or other curves without the aid of the transit theodolite, &c. Externally, it somewhat resembles a box sextant. It was composed of two essential parts only, viz., two plane mirrors, one of which was silvered over the whole of its surface, and the other over one-half of its surface. By a law of physical optics, which was called either combined or successive reflections, a series of images would be formed in the half-mirror, which were rendered available to set out any curve of any given radius, by applying the eye to an eye-hole in the back of the whole mirror, and at the same time setting the two mirrors at an angle to one another, equal to the required tangential angle. Then the several successive reflected images of a ranging rod, for instance, were seen to lie upon the circumference of a mathematically true circle. The curve was then readily set out in the field by simply placing other ranging rods in line with these several images. This could be done by looking through the unsilvered half of the half mirror, and planting the rods opposite to and overlapping the successive reflections. No error could arise in the manipulation, and the whole process of setting out a true curve was shortened and simplified. After setting the mirrors to the requisite tangential angle, no further adjustment or support was needed than could be afforded by the top of a ranging rod placed at the commencement of the curve, and shifted occasionally to any stake on the curve that the limits of distinct vision might require.

The Cemeteries of Paris.—The excellent regulation which prohibits the maintenance of burial places, as well as of abattoirs and cattle markets, within the boundaries of the city, has been broken through in the one case as in the other by the extension of the limits of the capital; the great cemeteries of Père la Chaise, Montmartre, and Mont Parnasse, like the old abattoirs, are all now within Paris. This infringement of a salutary rule will not, however, be of long duration; the municipal government of Paris is occupied with the subject, and before long, with the exception probably of family vaults, no funerals will take place within the walls or rather the fortifications which now fill the place of the ancient boundary. A large tract of poor land has been purchased in the neighbourhood of Pontoise, a small town in the department of the Seine-et-Oise, and distant about twenty miles from Paris, on the Northern Railway, for the new cemetery, and it is proposed, or at any rate under consideration, to make a special railway to be

devoted exclusively for the service of the cemetery. It is not stated whether there will be burial places created in other places as well as that referred to, but this seems probable, for otherwise the funerals would have to be conducted over a long distance. There are, however, local cemeteries in all the outskirts of the city, beyond the fortifications, and these will probably be made available for the use of the inhabitants of Paris in their vicinity. The transfer of the chief cemetery to a distance from Paris will interfere in some measure with an ancient custom of the people, who, on All Saints Day and the day following, the Jour des Morts, visit the graves of the departed and decorate them with emblems of regret and affection.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 18th July, 1866.

Par. Numb.
202. (B.) Bills—Public Health (Amendment.)
211. „ Commons (Metropolis) (amended.)
393. Education—Report.

Delivered on 19th July, 1866.

206. (B.) Bills—Public Health (amendments by Mr. Walpole) (corrected Copy.)
210. „ Hares and Rabbits (Scotland.)
212. „ Public Schools.
213. „ Tramways (Ireland) Acts Amendment (amended by Select Committee.)
214. „ Overseer of the Poor (small Parishes)
215. „ Colonial Branch Mints.
216. „ Drainage and Improvement of Lands Act (Ireland) (Provisional Order.)
217. „ Courts of Justice.
218. „ Public Works, Harbours, &c.
219. „ Public Works Loan (Ireland.)
220. „ Railways (Ireland) Temporary Advances.
393. „ Navy (Turret Ships)—Correspondence.
National Education (Ireland)—Thirty-second Report.

Delivered on 20th July, 1866.

221. Bills—Poor Law Amendment.
222. „ Parochial Buildings (Scotland) Act Amendment.
385. Writs Registration (Scotland) Bill—Report and Evidence.
396. Mines—Returns.
399. Civil Services—Supplementary Estimate.
403. Chamber of London—Annual Accounts.
407. National Education (Ireland)—Rule.
414. Navy—Supplementary Estimate for increased pay to Medical Officers.
415. Navy—Supplementary Estimate (Ship on the design of Captain Coles.)
416. Navy—Supplementary Estimate (completion of Ship "Northumberland.")
417. Railways (Ireland)—Treasury Minutes.
426. Revenue Departments—Supplementary Estimate.
Customs—Tenth Report of Commissioners.

Delivered on 21st July, 1866.

409. Cattle Diseases (Ireland) Act—Order in Council.
413. British Museum—Communications.

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457. East India Army (Regimental Numbers)—Returns.

Delivered on 23rd July, 1866.

223. Bills—Fees (Public Departments.)
226. „ Railway Construction Facilities Act (1864)—Amendment.
229. „ Turnpike Acts Continuance.
230. „ Glebe Lands (Scotland)—Lords Amendments.
231. „ Naval Discipline.
374. East India (Progress)—Statement.
391. Thames Navigation—Minutes of Evidence.
402. Redundant List (Public Departments—Return.
405. Thames Conservancy—General Report.
420. Small Pox in Sheep—Order.
421. Cattle, &c. Importation (Netherlands—Two Orders in Council.
430. Queen's University (Ireland)—Patent granting Supplemental Charter.

Delivered on 24th July, 1866.

227. Bills—Traffic Regulation (Metropolis.)
228. „ Turnpike Trusts Arrangements.
232. „ Parishes (Scotland) Act (1848) Amendment.
410. Friendly Societies (Scotland)—Quinquennial Report.
443. (A.) Poor Rates and Pauperism—Return (A.)
Public General Acts—Caps. 49 to 52.

Patents.

From Commissioners of Patents' Journal, July 20th.

GRANTS OF PROVISIONAL PROTECTION.

Blinds and shutters—1796—A. Clark.
Bobbins 1804—A. V. Newton.
Bottles, filling and corking—1817—W. Thompson.
Bricks—1770—D. Nichols and W. B. Leachman.
Bricks, &c., burning and drying—1794—R. Kunstmann.
Buoys, lighting—1651—A. Miroude.
Coal into lumps, combining—1782—H. G. Fairburn.
Coin, surfaces for disposing and picking up—1797—J. Murray.
Connectors for wires, &c.—1825—C. W. Farmer, W. B. Partridge, B. J. P. Webb.
Cucumbers, slicing and paring—1801—W. Moseley.
Envelopes—1795—P. Simard.
Fibrous substances, preparing—1680—A. Lee.
Fire-arms, breech-loading—1793—C. Harvey.
Fire-arms, breech-loading—1810—W. J. Curtis.
Furnaces—1789—J. A. Salmon.
Gas pipes, fittings for—1776—J. Brotherton.
Looking-glass presses—1800—P. J. Bellot, sen.
Marine steam engines—1802—J. Elder.
Neck-tie or scarf retainer—1807—G. Davies.
Ordnance—1819—W. Hobbs.
Painters' easels—1809—J. S. Cuthbert.
Photographic printing frames—1786—L. Field.
Plastic compounds—1760—F. Fried.
Sewing machines—1798—W. Clark.
Shafts, sinking—1784—J. D. Brunton.
Ships, rig of—1400—C. Chapman.
Shuttle tongues—1799—T. Ivers and J. Haddock.
Steam boilers—1792—T. Lishman.
Steam boilers—1811—J. Howard and E. T. Bousfield.
Steam engine valves—1808—S. Clark.
Stone, smoothing the surface of—1730—T. Smith.
Stop valves—1787—W. Chesney.
Taps and dies—1765—W. Adkins.
Telegraph and signal posts—1803—W. Baines.
Telegraph, transmitting messages by—1646—F. J. Bolton.
Weaving, looms for—1790—C. Heptonstall.
Weaving, looms for—1791—J. Mounier, C. D'Hondt, and J. Meurat.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Railway trains, communication by signals between passengers, guards, and drivers of—1815—I. Gregory.
Screw-bolts—1816—G. Haseltine.

PATENTS SEALED.

203. T. Rowatt.	250. J. A. Castree.
218. T. Prideaux.	253. F. Wise.
220. W. Brookes.	268. W. Justice and E. Guild.
221. W. Hodgkinson.	284. A. Chaplain.
227. E. Hopkins.	314. J. Mallison.
229. J. W. Evans.	319. J. B. Grant.
231. M. H. Lishman and E. Chambers.	411. W. N. Wynn.
233. E. Turney and J. Turney.	420. J. Davidson.
238. G. Hinchliffe.	446. J. Patterson.
241. J. Jones.	1374. W. E. Newton.
243. W. Clark.	1391. J. W. Bartlett.
245. J. Soutter.	1396. W. E. Newton.
	1397. G. Macdonald.

From Commissioners of Patents' Journal, July 24th.

PATENTS SEALED.

246. J. Piddington.	331. A. Murray.
249. G. Dyson.	344. R. Jobson.
265. H. Sherwood.	397. N. H. Felt.
266. J. Spencer.	427. J. G. Clarke.
270. J. Howden.	433. W. F. Cooke.
271. S. Cook & W. H. Hacking.	1091. J. G. Jones.
272. J. H. Brown.	1107. E. C. Nicholson.
274. W. W. Pocock.	1248. W. de la Rue.
281. J. Orr.	1366. G. A. Jasper.
305. H. A. Bonneville.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1803. A. Clark.	1962. J., J., A., & W. Thornton.
1830. W. Naylor.	1820. F. L. H. Danchell.
1854. B. Birnbaum.	1821. C. H. Roeckner.
1812. J. and W. H. Bailey.	1843. M. A. Soul.
1818. R. Weare.	1832. P. R. Jackson.
1828. R. A. Brooman.	1833. J. Ronald.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1738. J. Gillott.

Registered Designs.

An Improved Treble Elliptic Carriage Spring—July 14—4790—David Davies, St. Julian's Friars, Shrewsbury.

Journal of the Society of Arts.

FRIDAY, AUGUST 3, 1866.

Announcements by the Council.

Programme of Examinations for 1867.

PRELIMINARY NOTICE.

I. The Examinations described herein have been established for the benefit of the members and students of Institutions in Union with the Society of Arts. Such persons are commonly mechanics, artisans, soldiers,* labourers, clerks, tradesmen and farmers in a small way of business, apprentices, sons and daughters of tradesmen and farmers, assistants in shops, and others, of various occupations, who are not graduates, undergraduates, nor students of a University, nor following nor intending to follow a learned profession, nor enjoying nor having enjoyed a liberal education. To all such members and students in the Institutions, and to other persons of the like condition, male and female, the examinations, certificates, and prizes, described in this programme, are open on the general conditions stated herein. Persons, however, who are, or have been, professional teachers or pupil teachers; persons who either are enjoying or have enjoyed a liberal education, or who occupy a higher position in society than those above described, may obtain certificates, but cannot compete for the prizes, of which particulars are given at pages 12 and 13.

II. The certificates are not competed for. They are awarded as records of positive, not comparative, attainment. The prizes are competed for.

III. For the conditions on which persons of a higher grade in society may be examined and receive certificates, but not compete for prizes, see paragraph 4 (D).

IV. The candidates for examination have not to go to a distance from their homes. The examinations are held in all places in the United Kingdom where a Local Educational Board connected with the Society of Arts is willing to make the requisite arrangements.

V. For a list of the Local Boards already formed, see page 609.

VI. For instructions as to the formation of Local Boards and their duties, see page 602.

The EXAMINATIONS are—

(1.) The Previous Examinations by District Unions and Local Boards for ascertaining the fitness of candidates to present themselves at the Final Examination.

(2.) The Final Examination by the Society of Arts Board of Examiners, under the supervision of the Local Boards.

PREVIOUS EXAMINATIONS BY DISTRICT UNIONS AND LOCAL BOARDS.

1. The object of these Examinations is to "sift" the Candidates for the Final Examinations, so as to keep back (1) those who are not fairly grounded in the elements of education—spelling, writing, and arithmetic—and (2) those who are not fairly acquainted with the subject or subjects in which they desire to be examined by the Society of Arts, and are therefore unlikely to succeed in that Examination. The sifting in the above-named elementary subjects may be effected at the discretion of the Local Boards; they should examine their Candidates in spelling and writing by dictating to them a passage from an English author for them to write down; in arithmetic by setting them moderately easy questions to work out in the usual manner. The best mode of sifting the Candidates in the special subjects in which they desire to be examined by the Society of Arts is for the Local Boards to examine them therein by means of printed (or written) questions and written answers; but, where a Local Board finds itself without the means of conveniently holding such an Examination in any special subject, such Board may satisfy itself in any other mode, and state simply that it has satisfied itself, that the Candidate is fit to be examined by the Central Board in that subject.

2. The Previous Examinations must be held sufficiently early in the year to enable the proper returns to be made, as explained in par. 6.

FINAL EXAMINATION BY THE SOCIETY OF ARTS.

3. No candidate can be admitted to a Final Examination unless duly returned by a district Union or Local Board as having passed a Previous Examination.

4. Every admitted candidate must be at least 16 years of age.

(A). Members of, or students of classes in, Institutions in Union with the Society of Arts, are examined	Free.
(B). Members of, or students of classes in, Small Institutions,* not in union with the Society of Arts, but subscribing one guinea a year for admission to the Examinations alone, are examined	Free.
(C). Members of, or students of classes in, "Small Institutions"* not in Union with the Society of Arts, but connected with it through a District Union or Local Board, are examined on payment of a fee of	2s 6d.

N.B.—It will be understood that Candidates coming under the heads *(A)*, *(B)*, or *(C)* must not be of a higher class in society than those described in par. I. of the Preliminary Notice.

(D). Persons of a higher class of society than those described in paragraph I. (Preliminary Notice), cannot compete for prizes, but may be examined for certificates on payment of a fee of	5s.

5. The Council in every case require the Local Boards to certify whether a candidate should pay this higher fee; and it is earnestly hoped that in any instance where a Local Board has reason to believe that a candidate is or has been a teacher, or that he or his parents occupy such a position in society, or are in such easy pecuniary circumstances as to disqualify him, according to the regulations, for competing for a prize, they will at once, in case of certainty, return him as not competing for a prize, or in case of doubt, communicate with the Secretary of the Society of Arts.

6. A copy of Form No. 2 will be forwarded in February to the Secretary of each Local Board, and must be filled up and returned to the Secretary of the Society of Arts before the 2nd of March. The requisite number of forms No. 4 will then be forwarded, and these, when filled up, must be returned not later than the 18th of March. Each of these forms, when returned, will be numbered at the office of the Society of Arts, and a card for each candidate, with his name and his

* The following circular memorandum (Gen. No. 331), addressed to the army at home, has been issued:—"Miscellaneous 1 (1865).—The Field Marshal Commanding-in-Chief desires it to be notified that there will be no objection to soldiers, their wives, and families, being permitted to present themselves for instruction and examination at the Educational Institutes in connection with the Society of Arts, on the understanding that they are not on that account to be exempt from any military duty, nor, except in special cases, to be out of barracks after watch-setting or tattoo.—By command of his Royal Highness the Field Marshal Commanding-in-Chief, James Yorke Scarlett, Adj. Gen.—Horse Guards, S.W., 11th March, 1866."

* Small Institutions are defined as those which have an income of less than £75 a year.

number, will afterwards be forwarded to the Secretary of the Local Board for distribution, together with copies of the time-table.

7. The printed papers of questions in the various subjects will be afterwards forwarded to the Secretary of the Local Board; details as to the mode in which the Final Examination is to be conducted are contained in the Letter of Instructions (Form No. 6), and members of the Local Boards should make themselves thoroughly acquainted with them.

8. When the Candidates' papers have been submitted to the judgment of the Society's Examiners, certificates of three grades will be awarded, and the names of the Candidates who obtain prizes and certificates will be afterwards published in the *Journal of the Society of Arts*.

9. A Candidate who has obtained from the Society a certificate of the 1st class in any subject cannot again be examined in the same subject; but a Candidate who has obtained a certificate of the 2nd or 3rd class may, on the recommendation of the Local Board, be examined in the same subject, in a subsequent year, without again passing the Previous Examination.

10. A Candidate who, having obtained a certificate in any subject, desires to be examined in some other subject, in a subsequent year, may be "passed" by the Local Board, after an examination in that subject, without re-examination in the elementary subjects; but, in all cases, the name must be returned in the proper form. (No. 4).

11. Particulars of the subjects for the Final Examination are given below.

12. The Time-table has been drawn up to meet the general convenience of the Candidates; and *no variation* of it can *possibly* be allowed, so that, in choosing the subjects in which they desire to be examined, candidates must take notice of the arrangements of this Time-table, as they *cannot* be examined in *two* subjects which are set down for the same evening. The days and hours of Examination must be *strictly* adhered to.

13. The Examiners will reject all ill-written, ill-spelt, ill-composed, or ungrammatical papers that may be laid before them.

Time-Table for 1867.

Tuesday, 9th April, From 6.30 to 9.30 p.m.	Wednesday, 10th April, From 6.30 to 9.30 p.m.	Thursday, 11th April, From 6.30 to 9.30 p.m.	Friday, 12th April, From 6.30 to 9.30 p.m.
Arithmetic. Trigonometry. Electricity and Magnetism. Light and Heat. Mining and Metallurgy. Geometrical Drawing. German. Floriculture.	Book-keeping. Navigation, &c. Conic Sections. Chemistry. Music. Domestic Economy. English History. Italian.	Algebra. Practical Mechanics. Animal Physiology. Political and Social Economy. French. † English Literature. Fruit and Vegetable Culture. Freehand Drawing.	Geometry. Mensuration. Principles of Mechanics. Botany. Geography. Latin. Logic and Mental Science. Spanish.

† Two Papers of one hour and a half each in this subject are considered as one.

LOCAL EDUCATIONAL BOARDS.

14. Local Boards may be formed wherever the managers of Institutions, or other persons, may be prepared to cooperate with the Society of Arts.

15. Each Local Board must consist of at least three members, and must have a Chairman and a Secretary. The district for which the Board is to act should be defined, and the composition of the Board must be such as to command the respect and confidence of the neighbourhood. No member or officer of a Local Board can be admitted to examination.

16. The duties of the Local Boards may be defined as follows:—

(*A*) To give publicity to the system of Examinations by the circulation of the programmes, hand-bills, &c. (copies of which will be furnished *gratis* on application), and to give encouragement and advice to those young persons who are likely to become candidates.

(*B*) To hold the Previous Examinations.

(*C*) To superintend the Final Examinations.

17. Local Boards make no payment to the Society, unless they exercise the power of admitting candidates who are not members of any Institution in union with the Society of Arts (see par 4 *C*.); in which case a subscription of one guinea a year must be paid.

18. A detailed list of each Local Board (giving the exact address of the Secretary) must be submitted to the Council of the Society of Arts before the 1st of February, 1867, when the general list of such Boards will be published; and where a Local Board comprises so large a district that, for the convenience of the candidates, Branch Local Boards have to be formed, lists of these must also be given. All changes in the composition of the Boards must be notified to the Society of Arts.

N.B.—Local Boards may also usefully direct their attention to the holding of Preparatory Examinations in Elementary Subjects, either upon the system described at page 16, or upon any other system that they may prefer.

SUBJECTS FOR THE FINAL EXAMINATION IN 1867.

19. In the following paragraphs will be found brief outlines of the subjects in which candidates may be examined, and their attention is especially drawn to this part of the Programme. In many instances the Examiner has set down certain Text-books; but, in most cases, a candidate may exercise his own judgment as to what Text-book he uses; real knowledge, however or wherever acquired, will be accepted by the Examiners. In the following subjects, however, Political Economy, English History, English Literature, Logic, Latin and Roman History, French, German, Italian, and Spanish, the course of study is necessarily prescribed with more or less exactness.

I.—Arithmetic.

Examiner.—Rev. Alexander Wilson, M.A., National Society, London.

20. Practice—Simple and Compound Proportion—Interest—Discount—Insurance—Vulgar and Decimal Fractions; with the principles of a Decimal Notation in money on the basis of the pound unit.

21. The questions framed from the preceding syllabus will consist mainly of practical problems, and the Examiner will take into account not only the correctness of the answers, but also the excellence of the methods by which they are worked out, and the clearness and neatness of the working, *which must always be shown.*

22. Text Books:—Any of the modern treatises on Arithmetic, such as Hunter's Text Book (*National Society*), Colenso (*Longmans*), or Barnard Smith (*Macmillan*).

23. The Examiner, in his remarks on the work done by the candidates on the last occasion, says:—"There are still unmistakable evidences that a little more attention to theory would amply repay the time bestowed upon it."

II.—Book-keeping by Double Entry.

Examiners.—John Ball, Esq., of the firm of Messrs. Quilter and Ball, and Robert G. C. Hamilton, Esq., Principal Accountant to the Committee of Council on Education.

24. Candidates should be prepared to answer questions as to the nature and use of the different books usually kept in a merchant's office; to journalise a series of transactions from a waste book, and having posted the entries to the ledger, to balance the accounts, to prove the correctness of the postings by a trial balance, and finally

to exhibit an account of profit and loss, and a balance sheet.

25. Text Books:—Rudimentary Book-keeping (*Weale's Series*). Kelly's Elements of Book-keeping (*Simpkins and Co*). Examination-Questions in book-keeping by Double Entry, by the Rev. J. Hunter, M.A. (*Longmans*).

III.—Algebra.

Examiner.—Professor Sylvester, LL.D., F.R.S.

26. Elementary Operations and Fractions, Simple and Quadratic Equations and Problems leading to them. Involution and Evolution. Surds. Arithmetical, Geometrical, and Harmonic Series. Combinations and Permutations. Binomial Theorem. Scales of Notation. Interest and Annuities. Elementary Theory of Probabilities.

27. Text Books:—Todhunter's Algebra (*Macmillan*), Colenso's Algebra (*Longmans*), Lund's or any other modern treatise on Algebra.

IV.—Geometry.

Examiner.—Rev. B. Morgan Cowie, M.A., Professor of Geometry at Gresham College; one of H.M. Inspectors of Schools.

28. To obtain a first-class certificate, at least six problems and four propositions must be correctly done; to obtain a second-class, at least four problems and six propositions.

29. Text Books:—Euclid, Books I., II., III., IV., VI., XI., as far as Prop. 21. Potts' smaller edition (*Parker*). Green's Euclid's Plane Geometry, practically applied, is a useful help to those who are studying by themselves (*Heywood*, Manchester; *Simpkin, Marshall and Co.*, London).

V.—Mensuration.

Examiner.—John Sykes, Esq., M.A., Assistant-Secretary to the Committee of Council on Education.

30. The calculation of the areas and circumferences of plane figures bounded by arcs of circles or right lines, and solid contents of cones, cylinders, spheres, &c. Candidates will be expected to be familiar with the different rules for measuring and estimating artificers' work, such as joiners', bricklayers', masons,' and plumbers' work, and to be able to prepare estimates of such work from given quantities.

31. Text Books:—Lund's Mensuration, Part III., of his Elements of Geometry and Mensuration. Tate's Mensuration. Young's Treatise on Mensuration (*Simms and M'Intyre*).

32. The Examiner, in referring to last year's papers, says:—"The working is in many instances too bare, and would be improved by a few words of explanation. Linear is sometimes confounded with square measure."

VI.—Trigonometry.

Examiner.—Rev. T. G. Hall, Professor of Mathematics in King's College, London.

33. In Plane Trigonometry, the formulas for the trigonometrical functions of angles, the numerical solution of plane triangles, the use of logarithmic tables, and angular and exponential series.

34. Spherical Trigonometry, Napier's Rules, and the Solution of Spherical Triangles.

35. Text Books:—Snowball's or Todhunter's Trigonometry, Hall's Trigonometry for Schools, for Spherical Trigonometry (*Christian Knowledge Society*), or any other of the modern treatises on Trigonometry. Mathematical Tables (Chambers' Series).

VII.—Conic Sections.

Examiner.—Rev. Bartholomew Price, M.A., F.R.S., Sedleian Professor of Natural Philosophy in the University of Oxford.

36. The properties of the three curves treated geometrically; also as deduced from the cone. The principles of projection, orthogonal and central, applied to derive the properties of the conic sections from those of the circle.

37. Analytical Conics, including the equations of the straight line, the circle, the three conic sections, and the general equation of the second degree.

38. Text Books: Drew's Conic Sections (*Macmillan*). Taylor's Conic Sections (*Macmillan*). Salmon's Conic Sections (*Longmans*). Todhunter's Conic Sections (*Macmillan*).

VIII.—Navigation and Nautical Astronomy.

Examiner.—Rev. Joseph Woolley, LL.D., Inspector-General and Director of Studies, Royal School of Naval Architecture and Marine Engineering, South Kensington Museum.

39. A good knowledge of Plane and Spherical Trigonometry, of the definitions and terms used in Nautical Astronomy, and of the various measurements of time and their mutual conversions will be required, as well as skill in the use of logarithmic tables, and neatness, order, and accuracy in the numerical solutions of problems.

40. The candidate should understand the construction of charts; the nature and laws of circular storms; great circle sailing, &c.; the methods of determining the latitude, longitude, variation of the compass, and error and rate of a chronometer by astronomical observations, with the demonstrations of the formulæ employed; the use of nautical astronomical instruments, &c.

41. Text Books:—The Nautical Almanac (*Murray*). Riddle's Navigation and Nautical Astronomy (*Law*, Essex-street).

42. N.B.—Candidates in this subject should be allowed the use of the Nautical Almanac and Tables *during the Examination.*

IX.—Principles of Mechanics.

Examiner.—Rev. Jonathan Bates, M.A., late Fellow of Gonville and Caius College, Cambridge.

43. The properties of matter, solid, fluid, and gaseous.

44. Statics: The composition, resolution, and equilibrium of pressures acting on a material particle, and on constrained particles; machines; attractions.

45. Dynamics: the laws of motion; impact, projectiles; constrained motion; central forces; oscillation.

46. Rigid Dynamics: Motion of a rigid body about a point;—of a free rigid body;—of a system of rigid bodies.

47. Hydrostatics: Pressures of fluids; equilibrium of floating bodies; specific gravity; elastic fluids; machines; temperature and heat; steam; evaporation.

48. Hydrodynamics: Motion and resistance of fluids in tubes, &c.; waves and tides.

49. Pneumatics: Mechanical properties of air; the barometer, and other machines illustrating the mechanical properties of air.

50. Text Books:—Todhunter's Statics, or Parkinson's Mechanics. Goodwin's Mathematics. Miller's, Phear's, or Besant's Hydrostatics. Webster's Theory of Fluids. The treatises on these subjects in Orr's Circle of the Sciences. Golding Bird's Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks on Natural Philosophy. Tate's Examples in Mechanics. Baker's Statics and Dynamics (*Weale's Series*). Twisden's Practical Mechanics.

X.—Practical Mechanics.

Examiner.—T. M. Goodeve, Esq., Professor of Mechanics at the Royal Military Academy, Woolwich.

51. The applications of the principles of Mechanism to Simple Machines. The Steam Engine.

52. Text Books:—Bourne's Catechism of the Steam Engine (*Longmans*). Scott Russell on the Steam Engine. Nasmyth's Elements of Mechanism, with remarks on Tools and Machinery (*Weale*). Goodeve's Elements of Mechanism, second edition (*Longmans*).

XI.—Electricity and Magnetism.

Examiner.—Charles Brooke, Esq., M.A., F.R.S.

53. Construction and Properties of Magnets; Magnetic Instruments; Terrestrial Magnetism; The Mariner's Compass; Diamagnetism.

54. Statical or Franklinic Electricity; Voltaic Electricity; Electro-dynamics; Electro-telegraphy; Electro-metallurgy; Thermo-Electricity; Organic Electricity.

55. Text Books:—Golding Bird's Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks of Natural Philosophy (*Walton and Maberly*). Fleeming Jenkin's report on the Electrical Instruments in Class XIII. of the Exhibition of 1862, for Electro-telegraphy. Jamin, Cours de Physique.

XII.—Light and Heat.

Examiner.—**Richard Potter, Esq., A.M., late Professor of Natural Philosophy and Astronomy in University College, London.**

56. What is the sense of sight?—ancient theories—modern definitions and hypotheses of the nature of light—the especial privileges of animals which possess organs of vision—the simple laws or properties of light required to be known before we can discuss the structure of the eye, and the construction of telescopes, microscopes, and other optical instruments—optical images real and virtual—how do they occur in optical instruments.

57. Why do we distinguish between Physical and Geometrical optics?—what are double refraction of light—polarization of light—interference of light—examples of these properties, how shown—phenomena of recurring colours—examples—how are explained the colours of the soap bubble—the colours seen on looking towards a light through the feathers of small birds—the colours of mother-of-pearl—the rainbow, &c., &c.—the laws of the interference of polarized light—to describe cases of these splendid phenomena.

58. What are the definitions of heat, radiant, latent, and sensible?—what is meant by caloric?—hypotheses of the nature of heat—capacity of bodies for heat—the temperature of bodies—how measured by instruments—descriptions of thermometers and pyrometers—the scales of thermometers—how compared—how the volumes of solids, liquids, and gases depend on their temperature—absolute zero of cold—elastic force of vapours and gases produced by heat employed in steam and air engines—winds from the unequal heat of the atmosphere. What are the connexions and analogies of heat and light?

59. Text Books:—The Library of Useful Knowledge. Brewster's Optics (Cabinet Cyclopædia). Potter's Physical Optics, the descriptive and experimental treatise (or first part) (*Walton and Maberly*).

60. The Examiner, speaking of the work done on the last occasion, says:—"The remarks made last year apply in still greater force to the examinations of this year, that the candidates need more study in condensed and accurate methods, so as to enable them to make the best use of their time in examinations."

XIII.—Chemistry.

Examiner.—**A. W. Williamson, Esq., F.R.S., Professor of Chemistry, University College, London.**

61. Preparation and properties of the chief gases, acids, bases, and salts. Laws of combining proportion by weight and by volume. Analytical processes for the detection and separation of metals, acids, &c. Preparation and distinctive properties of the chief kinds of alcohol, of organic bases, fixed and volatile organic acids, sugars, woody fibre, starch, &c.

62. Candidates are expected to be able to explain chemical reactions by the use of symbols. Questions illustrative of general principles will be selected from the following, amongst other manufactures:—Metallurgy of lead, iron, and copper; bleaching, dyeing, soap-boiling, tanning; the manufacture of coal-gas, sulphuric acid, soda-ash, &c.

63. Text books:—Miller's Elements of Chemistry, Williamson's Chemistry for Students.

64. The Examiner, in his remarks on the papers worked by the candidates on the last occasion, attributes many of the failures to the fact that "chemical theories have of late been so much altered by the great extension of our knowledge of facts, that many teachers have not yet fully matured their system of instruction in accordance with the theories now prevailing." He confidently anticipates "great benefits to pupils and teachers from the change, when fully carried out—benefits such as have appeared elsewhere."

XIV.—Mining and Metallurgy.

Examiner.—**J. Arthur Phillips, Esq., Civil Engineer, Graduate of the Imperial School of Mines of France, &c.**

65. Candidates should be able to identify with facility the ores of the more common metals, and be acquainted with their chemical composition. They should also be familiar with the forms of occurrence of the various metallic ores, and the usual methods employed for their extraction and subsequent purification by crushing, stamping, washing, &c. Underground surveying, the principles of ventilation, particularly as applicable to collieries; a knowledge of furnace assaying, and a general acquaintance with the metallurgy of the more important metals are also required.

66. First-class certificates can be given to those only who have either acquired some practical knowledge of mining, or who possess a special acquaintance with the metallurgy of at least one of the useful metals.

67. Text Books:—Dana's Mineralogy (*Trubner and Co.*, Paternoster-row). Mitchell's Assaying (*Baillière*). Manual of Metallurgy (*Griffin*). Useful metals and their Alloys (*Houlston and Wright*). Ure's Dictionary of Arts, Manufactures, and Mines (*Longmans*). Percy's Metallurgy (*Longmans*). Metallurgy of Iron, Truran (*Spon*).

XV.—Botany.

Examiners.—**Daniel Oliver, Esq., F.R.S., F.L.S., Keeper of the Herbarium at the Royal Gardens, Kew, and Professor of Botany in University College, London.**

68. Sect. I.—The Structure of Plants and Vegetable Physiology. The Functions of the Various Organs, and their Morphological Relations. The Nature of the Principal Tissues. The meaning of Botanical Terms. The application of Structural and Physiological Facts to Practical Purposes.

69. Sect. II.—Systematic Botany. The general Principles upon which the Classification of Plants is based. The distinctive characters of the principal British Natural Orders of Plants. Naming Common Wild Flowers at Sight. The sources of the most important Economic Vegetable Products:—Timbers, Fibres, Fruits, Drugs, &c.

70. Sect. III.—Descriptive Botany. The Art of Describing Plants correctly in Scientific Language.*

71. Text Books:—Lindley's School Botany (*Bradbury and Evans*). Oliver's Lessons in Elementary Botany (*Macmillan*). Lindley's Theory and Practice of Horticulture (*Longmans*). Oliver's Guide to the Kew Museums (pamphlet) (*L. Reeve and Co.*).

72. Candidates will be expected to return three correct answers to questions in Section I., three in Section II., and at least two of the plants must be described and referred to their respective natural orders in Section III.

73. Students are very strongly recommended to the frequent practice of describing plants; at first on forms or "schedules," as given in Professor Oliver's "Lessons," page 59, and, when sufficiently advanced, in detail, as in the examples given at page 293 of the same work, and in Dr. Lindley's "School Botany."

74. The Examiner, referring to last year's papers, observes:—"While of late years much stress has rightly been laid upon the importance of testing candidates in practical and descriptive botany,—testing their knowledge by actual specimens—it will not do to allow this to operate unduly to the detriment of the more purely physiological branches."

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* Living plants are provided by the Society for this examination.

XVI.—FLORICULTURE.

Examiner.—Thomas Moore, Esq., F.L.S., Curator of the Botanic Gardens, Chelsea, and Floricultural Director of the Royal Horticultural Society.

75. The candidates will be expected to answer questions on any of the undermentioned subjects:—

76. Improvement of Races in Plants, by what means it can be commenced and carried forward. Hybridization, objects of. Conditions necessary to ensure fertility in Flowers.

77. Warming and Ventilation of Houses for Plant Culture. Influence of Ventilation on Plants confined in forcing houses. Limits of Temperature endurable by Plants, and how to turn this to advantage in Practical Floriculture. Bottom heat, value of in Plant Culture.

78. Watering, the *rationale* of, in the culture of Pot Plants. Liquid Manures, special recommendations of. Food of Plants, how and whence derived, and in what form received.

79. Propagation, the various modes of, and their special adaptations. Vitality of seeds, duration of, and how best preserved. Budding, Grafting, and Inarching, how performed, and to what subjects best adapted. Increase by cuttings and by layers. Leaf-cuttings, how is it that they can organize buds? Composts for various classes of Plants.

80. Acclimatisation. Is it possible to increase the hardiness of any race of plants, and what are the most likely means?

81. The leading Flowers of the different seasons, indicating those to be obtained naturally, and those by artificial means.

82. Special Culture—Ferns, Orchids, Succulents, Heaths, Hardy Annuals, Bedding Plants.

83. Text Books:—Lindley's Theory and Practice of Horticulture *(Longmans)*. McIntosh's Book of the Garden *(Blackwood and Sons)*. Thompson's Gardener's Assistant *(Blackie and Son)*.

84. The Examiner, in his remarks on the work done by the candidates on the last occasion, says they "fail most especially, as a rule, in conveying clearly and concisely the purport of their own replies, and lose force of expression by multiplying words. They are strongly recommended, as a part of their studies, to practice the writing out of short pithy remarks on each of the subjects set down in the programme, comparing their own remarks with the statements in the text books, and repeating this from time to time, cutting out all superfluous words, so that they may get the essential particulars well impressed on the memory."

XVII.—FRUIT AND VEGETABLE CULTURE.

Examiner—Robert Hogg, Esq., LL.D., F.L.S.

85. Sect. I.—*Fruit-Tree Culture.*—Kinds of Fruits adapted for various soils and exposures. The Propagation, Pruning, and Training of Fruit Trees. The Structure and Functions of the Organs of Trees, considered in their relation to growth and reproduction. The Forcing of Fruit-Trees, and their cultivation under glass, both in and out of pots. The Theory of Ripening, and the principles that ought to regulate the preservation of fruits after they are ripe or their subsequent maturation. The Packing of Fruit for transmission to great distances.

86. Sect. II.—*Vegetable Culture.*—The kinds and quantities of vegetable seeds and roots required for cropping gardens of given dimensions. The most approved mode of culture of the different kinds of vegetables and salads. The preparation of fermenting materials for artificial heating. The forcing of vegetables and salads.

87. Sect. III.—*General Subjects.*—Soils, Water, Atmospheric Air, Light and Heat in their relation to the successful cultivation of Fruit and Vegetables. Manures and their application. The Diseases and Insects to which Fruit Trees and Vegetables are subject, and their remedies. The erection, heating, and ventilation of garden structures.

88. Text Books:—Lindley's Theory and Practice of Horticulture *(Longmans)*. The Cottage Gardener's Dictionary *(Bell and Daldy)*. Hogg's Fruit Manual, 3rd edition *(171, Fleet-street)*. Rivers' Miniature Fruit Garden *(Longmans)*. Bréhaut's Modern Peach Pruner (171, *Fleet-street*.)

89. The Examiner, in his remarks on the papers worked on the last occasion, says:—"I am pleased to see the rising generation of gardeners devoting themselves to a study of the theory of gardening—to a study of those principles which ought to regulate every gardening operation, and without a perfect knowledge of which there can be no perfect practice. Practice without a knowledge of the principles by which it is governed is an insecure and baseless foundation on which to rest when natural conditions are disturbed or unexpected difficulties arise. I therefore urge on gardeners most strongly the necessity of studying the principles which regulate vegetation; but at the same time I desire also to see the fruits of that study exemplified in the practice, for a knowledge of the theory without the practice is worthless."

XVIII.—ANIMAL PHYSIOLOGY IN RELATION TO HEALTH.

Examiner.—John Marshall, Esq., F.R.S., F.R.C.S., Surgeon to the University College Hospital, and Lecturer on Anatomy at the Government Department of Science and Art.

90. The general principles of Animal Physiology, and the application of them to the preservation of health and to the wants and emergencies of daily life.

91. Text Books:—Carpenter's Animal Physiology, 1859 (*Bohn*). Mapother's Physiology and the Principles of Disease (*Longmans*). Mapother's Lectures on Public Health (*Longmans*). Lardner's Animal Physics (*Walton and Maberly*). Translation of Milne Edwards' Manual of Zoology (*Renshaw*). Marshall's Descriptions of the Human Body, with Atlas (*Day and Son*), for details of Anatomy.

92. The Examiner, in his remarks on the last examination, says:—"A juvenile inability to grasp the subject, and a grievous deficiency in spelling, are still noticeable; but they are limited to a smaller number of candidates."

XIX.—DOMESTIC ECONOMY.

Examiner.—Rev. R. Dawes, Dean of Hereford.

93. *Questions for Male and Female Candidates.*—This subject embraces a knowledge of the practical management of all household matters which tend to the well-being and happiness of domestic life.

94. The essentials of domestic arrangement, according to circumstances, for a healthy and comfortable dwelling; the nutritious properties of food, animal and vegetable; modes of cooking, &c.; fuel and other household stores; weights and measures; keeping of household accounts; domestic expenditure in general; and profitable investment of small savings.

95. Text Books:—Chemistry of Food, by Dr. Lankester. Manual of Domestic Economy, by Tegetmeier. Animal Physiology (*Chambers' Educational Course*). Physiology for Schools, by Mrs. Bray (*Longmans*).

XX.—POLITICAL AND SOCIAL ECONOMY.

Examiner.—Charles Neate, Esq., M.A., M.P., late Professor of Political Economy in the University of Oxford.

96. The examination will be devoted to the study of Civil Government and Social Economy, as set forth in the 3rd and 4th books of Stephens' Commentaries on the Laws of England. N.B.—In order to meet the question of expense as regards this work, candidates are informed that the earlier editions, which are obtainable at a reduced price, may be used, so long as they are not earlier than the 3rd edition.*

* A limited number of copies of the 3rd edition are on sale at Messrs. Wildy and Son's, law booksellers, Lincoln's-inn-gateway, Carey-street, price £1 each.

97. Professor Fawcett's Manual of Political Economy (*Macmillan*) must be studied by those who desire to obtain first-class certificates.

98. Referring to last year's papers, the Examiner says:—"Some of the candidates have only answered the questions referring to political economy proper." He "desires to impress upon the candidates generally the importance of studying the institutions of their country."

XXI.—Geography.

Examiner.—Wm. Hughes, Esq., F.R.G.S., Professor of Geography in King's College, London.

99. Candidates must show a sound knowledge of Elementary Geography, physical and descriptive. Such knowledge must embrace an acquaintance with at least the outlines of the great natural features of the globe, the political division of countries, and the localities of towns and other places of importance. This knowledge will be looked for in fuller extent with regard to the British Islands, and the various portions of the British Empire, than with regard to other countries. The growing importance of the colonial and foreign dependencies of Britain renders a knowledge of their geography now more than ever necessary. The Australian colonies, New Zealand, and British North America, are hence proposed as subjects for more especial study on the part of the intending candidates for the ensuing year's examinations, and their attention is directed to them accordingly. In evidence of the knowledge possessed regarding those regions, the candidate will be required to sketch, from memory, a map of any one of the Australian or North American colonies that may be named by the examiner. Such sketches need not possess accuracy of detail, but should at least show the general direction of coast-lines, mountain-chains, or river-courses, with the localities and names of the principal towns.

100. Candidates who aim at the highest class of certificate should be also prepared to answer such questions upon Geography in its relation to the Physical Sciences and the History of Mankind, as involve a general acquaintance with the subject of climate, the laws of Meteorology, the Distribution of Plants and Animals over the Globe, the leading outlines of Geology, the Ethonographic Division of the Human Race, and the commercial resources of different lands. This kind of knowledge is looked for, not in place of geographical knowledge of a more elementary kind, but as supplementary to it, and throughout based upon it.

101. Text Books:—Manual of Geography, by William Hughes *(Longmans)*. Geography of British History, by William Hughes *(Longmans)*. Guyot's Earth and Man *(Parker and Son)*. Page's Introductory Text Book of Geology *(Blackwood)*. The School Physical Atlas *(either Johnstone's, Phillips's, or that published by the National Society.)*

102. The Examiner, referring to the candidates who were unsuccessful last year, says:—"The chief cause of failure appears to lie in the want of methodised study—directed to a definite purpose, and guided by better adjuncts, in the way of books and maps. . . . Mere school-boy knowledge (which is all that a large number of the answers exhibit) will neither secure the higher awards of the Society, nor be attended by the fructifying influences which information of larger scope—acquired by gradual and systematically-organised stages—exerts on the mind of the true student. Upon these and other points, I would strongly urge upon intending candidates a closer attention to the conditions and suggestions offered in the programme."

XXII.—English History.

Examiner.—The Rev. J. S. Brewer, M.A., Professor of Modern History in King's College, London.

103. English History and English Constitutional History.

104. Text Books:—Manual of English History, by Ross; or The Student's Hume. Creasy's English Constitution.

105. Special subject:—The reign of Charles I. Lingard.

XXIII.—English Literature.

Examiner.—Rev. Samuel Clark, M.A., *Chairman of the Board of Examiners.*

106. Any two, but not more than two, of the authors in the following list may be taken up for examination:—Shakspeare—Hamlet; Henry V.; The Tempest. Milton—Paradise Lost, Book I—VIII. Butler—The Analogy, Part I. Shaw's History of English Literature, edited by Dr. Smith (published by *Murray*), Chapters I. II., IV., V., VI., VII., VIII., IX., XV., XX., XXII.

107. Candidates are recommended to make a very careful study of the text of the authors they may select. The questions on each author will be divided into two sections, the first intended to test the candidates acquaintance with the text, the second his knowledge of the subject matter, and his critical and literary information. Full marks will not be given for answers in the second section, if those in the first section do not prove satisfactory. No marks will be given for anything beyond answers to the questions.

108. Every candidate will be required to take either Shakspeare or Milton as one of his books.

XXIV.—Logic and Mental Science.

Examiner.—J. D. Morrell, Esq., LL.D., one of her Majesty's Inspectors of Schools.

109. Logic: Candidates will be expected to answer questions on the different processes of thought, and the symbols by which they are expressed. Every Candidate must be prepared to analyse examples of reasoning, and to detect fallacies.

110. Text Books:—Whateley's Elements of Logic, or Morell's Handbook of Logic.

111. A Candidate for a second or third class Certificate will be expected to prepare, in addition, any one of the following books which he may select:—Mill's System of Logic, Book III., Of Induction; Adam Smith's Theory of Moral Sentiments; or Sir William Hamilton's Lectures on Metaphysics, Lectures xx. to xl.

112. A Candidate for a first-class Certificate will be expected to prepare any two of these works which he may select.

XXV.—Latin and Roman History.

Examiner.—Rev. F. Temple, D.D., Head Master of Rugby School.

113. Cicero, Tusc. Quæst., Lib. I. Horace, Carm., Lib. I.

114. Roman History to the death of Augustus Cæsar. Text Book:—Liddell's History of Rome, in one volume.

XXVI.—French.

Examiner.—Alphonse Mariette, Esq., M.A., Professor of French, King's College, London.

115. The Examination Paper will be divided into three parts.

116. The first will comprise grammatical questions and an extract from a modern French writer, to be translated into English. Candidates merely aiming at a 3rd class certificate should confine themselves to this first part.

117. The second part will comprise, together with a few grammatical questions, an English extract to be translated into French, and a list of idiomatic expressions to be rendered from French into English, or *vice versa*. This should be done satisfactorily by the candidate who aims at a 2nd class certificate.

118. In the third part, candidates for a 1st class certificate will have to translate an English extract into French (to which great importance is attached), and to

answer properly *(in French)* some *elementary* questions on the two following subjects:—

1. French literature during the first 30 years of the present century.
2. The History of France, from the Revolution of 1789 to the restoration of the Bourbons in 1815.

119. Books recommended:—Mariette: Half-Hours of French Translation (*Williams and Norgate*, London and Edinburgh). Nisard: Histoire de la Littérature Française, vol. 4 (*Williams and Norgate*). Duruy: Histoire de France, vol. 2 (*Williams and Norgate*).

120. The Examiner, referring to last year's work, attributes the small number of good papers to "the evident neglect by most candidates of the works recommended to their notice in the programme of examinations. As a natural consequence of this neglect, the less elementary questions in Part II., bearing upon some very important and practical features of the French syntax as contrasted with the English, have been left unanswered by the greater number of candidates, and yet every one of those questions is to be found fully explained in the very first pages of one of the books recommended in the programme."

XXVII.—German.

Examiner.—Dr. Wintzer, Teacher of German in King's College, London.

121. The examination paper will consist of three sections. The first will contain extracts from the works recommended for reading; the second grammatical questions and idioms; and the third English phrases, an extract from an English author (both to be turned into German), questions on a certain period of the history and literature of Germany, and a theme to be worked out in German.

122. Each Candidate must translate at least one of the extracts in section 1, but candidates for first-class certificates two, one from prose, the other from poetry. The latter must also translate well from English into German, answer in German a few questions on the literature and history of Germany, and write a well-expressed essay on a subject which will be announced to them when they come up for examination.

123. Books recommended:—*Schiller's* 30 jähriger Krieg (2nd half of Book II.), Jungfrau von Orleans (Prolog und erster Aufzug); *Göethe's* Iphigenie (acts I. and II.); *Kohlrausch's* Deutsche Geschichte (fünfter Zeitraum: Maximilian I. to the end of Mittelalter), and *Vilmar's* Geschichte der Deutschen National-Literatur (Aelteste Geschichte, bis 1150).

XXVIII.—Italian.

Examiner.—Signor Pistrucci, Professor of Italian in King's College, London.

124. Candidates for first-class certificates will be required—(1st.) To translate into English passages from some of the principal Italian poets and historians, and to answer the grammatical questions which may be added to those passages. (2nd.) They will also translate into Italian an extract from some English author. (3rd.) And turn a few familiar idioms into their equivalents, from Italian into English, and *vice versa*.

125. For second and third-class certificates candidates will translate into English some selection from Metastasio's drammi, and Foscolo or Manzoni's prose works, and answer a certain number of grammatical questions.

XXIX.—Spanish.

Examiner.—B. B. Aguirre, Esq., Lecturer on Spanish in King's College, London.

126. Candidates for a first-class certificate will have to translate an English passage into Spanish, to render into English or French several idiomatic phrases, and to write in Spanish a short essay.

127. Candidates for a second-class certificate will have to translate from English into Spanish, and to answer several questions upon the Spanish verbs.

128. Candidates for a third-class certificate will have to translate from Spanish into English, and to answer several grammatical questions.

129. Books recommended:—Spanish Gil Blas; Conquista de Mejico, por Dn. Jose Morales Santistevan; Trozos escojidos delos mejores hablistas espanòles, por Dn. Carlos Ochoa; Estudios filolójios, por Dn. Manuel Martinez de Morentin.—Don Quixote translated into English by Charles Jarvis, Esq.

XXX.—Freehand Drawing.

Examiner.—F. S. Cary, Esq.

130. In freehand drawing the Candidate will be required to show a practical knowledge of the principles usually applied in the imitation of natural and artificial forms, such as furniture, manufactured articles, ornament, foliage, and the human form.

XXXI.—Geometrical Drawing.

Examiner.—Thomas Bradley, Esq., Professor of Geometrical Drawing in King's College, London, and at the Royal Military Academy, Woolwich.

131. Practical Geometry, or Geometrical Drawing, required by the Mechanic, Engineer, Builder, and all in any way employed in the arts of construction. The Candidates will be examined in Practical Plane Geometry, the construction of right line figures of given areas, and of curved lines required in the arts, &c.; in Practical Solid Geometry, Elementary Problems on the line and plane, in space, and their combinations, the representation by orthographic projection of simple solids from conditions; in the principles of Development as used in the construction of Maps, &c.; and in Elementary Perspective Projection as far as it is required by the Architect.

132. Text Books:—Geometry, Plane, Solid, and Spherical *(Library of Useful Knowledge)* is especially recommended as a work to be studied on Theoretical Geometry.—Elements of Geometrical Drawing, published by the Committee of Council on Education, 2 parts *(Chapman and Hall)*.—Hall's Elements of Descriptive Geometry for students in Engineering. Heather's Descriptive Geometry. Also the following French Works:—Elémens de Géométrie Descriptive, par S. F. Lacroix; Traité de Géométrie Descriptive par Lefebure de Fourcy; Nouveau Cours raisonné de Dessin Industriel, par Armengaud, aîné, et Armengaud, jeune, et Amouroux; Bardin's Works on Descriptive Geometry.

133. The Examiner, speaking of the work done last year, says:—"The practical geometry of the line and plane is not sufficiently studied; most candidates seem to consider plane geometry as constituting the most important branch of the subject; as regards application in the arts, the reverse is the truth—plane geometry is of little use except as ancillary to solid. No one can be considered as tolerably grounded in this subject who could not construct every question in this division of the paper."

XXXII.—Theory of Music.

Examiner.—John Hullah, Esq.

134. Notation, the modern modes, intervals, time signatures, the stave, transposition, modulation, terms and characters in common use.

135. The Elements of Harmony.

136. Musical History and Biography.

137. Arrangements must be made, in the Previous Examinations by the Local Boards, to test Candidates, by oral examination, in their knowledge or appreciation of the *sound* of musical successions and combinations. A form of the test to be used for this purpose by the Local Boards at the Previous Examination, will be sent by the Council to such Local Boards as may *apply for it*, in due time before the Examination.

138. The Examiner, referring to the last examination, says:—"Future candidates should bear in mind that wordy encomiums on great composers present no test whatever of acquaintance with musical history."

PRIZES FOR 1867.

THE PRINCE CONSORT'S PRIZE.

139. His Royal Highness the late President of the Society was pleased to offer annually to the candidate who, obtaining a certificate of the first-class in the current year, shall have obtained in that year and the three years immediately preceding it, the greatest number of such certificates, a Prize of Twenty-five Guineas, and this Prize Her Majesty the Queen has graciously intimated her intention to continue. This Prize cannot be taken more than once by the same candidate. It will be accompanied by a certificate from the Society of Arts, setting forth the special character of the Prize, and the various certificates for which it was granted.

GENERAL PRIZES.

*** *None of these Prizes will be awarded to a Candidate who does not obtain a Certificate of the First-class in the subject.*

Subject	Prizes
1. Arithmetic (F)	First Prize, £5. Second Prize, £3.
2. Book-keeping (F)	First Prize, £5. Second Prize, £3.
3. Algebra	First Prize, £5. Second Prize, £3.
4. Geometry	First Prize, £5. Second Prize, £3.
5. Mensuration	First Prize, £5. Second Prize, £3.
6. Trigonometry	First Prize, £5. Second Prize, £3.
7. Conic Sections	First Prize, £5. Second Prize, £3.
8. Navigation and Nautical Astronomy	First Prize, £5. Second Prize, £3.
9. Principles of Mechanics	First Prize, £5. Second Prize, £3.
10. Practical Mechanics	First Prize, £5. Second Prize, £3.
11. Electricity and Magnetism	First Prize, £5. Second Prize, £3.
12. Light and Heat	First Prize, £5. Second Prize, £3.
13. Chemistry	First Prize, £5. Second Prize, £3.
14.*Mining and Metallurgy	First Prize, £5. Second Prize, £3.
15.*Botany	First Prize, £5. Second Prize, £3.
16.*Floriculture	First Prize, £5. Second Prize, £3.
17.*Fruit and Vegetable Culture	First Prize, £5. Second Prize, £3.
18. Animal Physiology in relation to Health (F)	First Prize, £5. Second Prize, £3.
19. Domestic Economy (F)	First Prize, £5. Second Prize, £3.
20.*Political and Social Economy (F)	First Prize, £5. Second Prize, £3.
21.*Geography (F)	First Prize, £5. Second Prize, £3.
22. English History (F)	First Prize, £5. Second Prize, £3.
23. English Literature (F)	First Prize, £5. Second Prize, £3.
24. Logic and Mental Science	First Prize, £5. Second Prize, £3.
25. Latin and Roman History	First Prize, £5. Second Prize, £3.
26. French (F)	First Prize, £5. Second Prize, £3.
27. German (F)	First Prize, £5. Second Prize, £3.
28. Italian (F)	First Prize, £5. Second Prize, £3.
29. Spanish (F)	First Prize, £5. Second Prize, £3.
30. Freehand Drawing (F)	First Prize, £5. Second Prize, £3.
31. Geometrical Drawing (F)	First Prize, £5. Second Prize, £3.
32. Theory of Music (F)	First Prize, £5. Second Prize, £3.

SPECIAL PRIZES.

140. The whole of the General Prizes are offered to female candidates on the same terms as to male candidates; and, in each of the subjects marked F, an additional prize of £2 is offered by the Society of Arts to the *female* candidate who gets the highest number of marks with a certificate of the first-class. This special prize may be taken with, or apart from, any other prize.

141. In addition to the First and Second Prizes in Mining and Metallurgy offered by the Society of Arts, Sir Thomas Phillips, F.G.S., Chairman of the Council, offers a Third Prize of £2, and three prizes of books value £1 each, to candidates taking First-class Certificates in that subject.

142. In addition to the First and Second Prizes in Political and Social Economy offered by

* For extra prizes in these subjects see paragraphs 141, 142, 143, 144, and 145.

the Society of Arts, Mr. Harry Chester, a vice-President of the Society, offers a Third Prize of £2, and three prizes of books value £1 each, to candidates taking First-class Certificates in that subject.

143. In addition to the Prizes in Geography, offered by the Society of Arts to candidates taking certificates of the First-class, the President and Council of the Royal Geographical Society offer an additional prize of £5 to the candidate who, taking any grade of certificate in Geography, shall obtain the highest number of marks in that subject.

144. In addition to the prizes in Botany, in Floriculture, and in Fruit and Vegetable Culture offered by the Society of Arts to candidates taking certificates of the First Class, the Council of the Royal Horticultural Society offers three additional Prizes of £5, £3, and £1 respectively to the three candidates who, taking any grade of certificate in Botany, obtain the highest number of marks in that subject; also two additional prizes of £5 and £3 respectively, to the two candidates who, taking any grade of certificate in Floriculture obtain the highest number of marks in that subject; also two additional Prizes of £5 and £3 respectively to the two Candidates who, taking any grade of Certificate in Fruit and Vegetable Cultcre, obtain the highest number of marks in that subject. These prizes are offered only to Candidates who are *bonâ fide* professional gardeners.

145. In addition to the Prizes in Floriculture, and in Fruit and Vegetable Culture, offered by the Society of Arts to candidates taking certificates of the First Class, the Proprietors of the *Gardener's Chronicle* offer three additional Prizes of £3, £2, and £1 respectively, for the three candidates, being *bonâ fide* professional gardeners, who, obtaining a Second-class certificate, at least, in Floriculture or Fruit and Vegetable Culture, shall obtain the highest number of marks in one of these subjects, and also a Second-class certificate, at least, in Book-keeping or Mensuration.

LOCAL EDUCATIONAL BOARDS.

The following is a List of the places at which Local Boards have already been formed, with the names of the Secretaries, from whom intending Candidates and others may obtain information relative to the Examinations:—

Local Boards.	Secretaries.
Aberdeen	Mr. Jas. Sinclair, Mechanics' Institution, Aberdeen.
Aldershot and Farnham District	Mr. Barrow Rule, M.C.P., Principal of the Classical and Mathematical School, Aldershot.
Alton	Mr. T. Bryant.
Ashford	Mr. T. Nesbit, 3, Dover-place, Ashford.
Banbridge (Ireland) Literary and Mutual Improvement Society	Mr. Alexander Black, Banbridge, County Down, Ireland.
Banbury	Mr. John H. Beale, Banbury.
Barnet	Mr. John Thimbleby, Barnet.
Belfast	Rev. W. C. McCullagh, Ballysillan, Belfast.
Bessbrook (Newry)	Mr. Wm. J. Wonfor, Bessbrook.
Birmingham and Midland Institute	Mr. Edwin Smith, Institute, Birmingham.
Bishop's Stortford	Mr. F. Woodham Nash, B.A., Sion House, Birchanger, Bishop's Stortford.
Blandford	Mr. J. B. Green, architect, &c., Salisbury-street, Blandford.
Bradford	Mr. James Simpson, Mechanics' Institution, Bradford
Brighton (for Sussex)	Mr. Barclay Phillips, 75, Lansdowne-place, Brighton.
Bristol	Mr. R. W. C. Ross, Athenæum, Bristol.
Burrage-road (Plumstead) Evening Classes	Mr. Josiah Hammond.
Bury St. Edmund's	Mr. John Jackson, Head Master of the Commercial School, Bury St. Edmund's.
Canterbury	Mr. W. D. Furley, Canterbury.
Carlisle Mechanics' Institute	Mrs. Jane Williamson, Mechanics' Institute, Carlisle.
Chatham, Rochester, Stroud, and Brompton	Mr. F. Butler, 112, High-street, Chatham.
Chelmsford	Mr. W. Cutts and Mr. Jesse Garrood, Chelmsford.
Christchurch	Mr. W. Judd, F.C.S., High-street.
Darlington	Mr. C. Jackson, Darlington.
Deptford	Mr. T. Earland, 2, Wellington-grove, Greenwich-road.
Derby	Mr. H. M. Holmes, Hon. Local Sec. to the Society of Arts, London-road, Derby.
Devonport	Mr. W. Mogg and Mr. Samuel Chapple, Mechanics' Institute, Devonport.
East Lancashire Union of Mechanics' Institutions, Burnley	Mr. John Sutherland, Post-office, Burnley.
" Haslingden	Mr. J. Binns, Haslingden.
" Rawtenstall	Mr. Chas. King, Rawtenstall.
Faversham	Mr. Frederick W. Monk, Managing Director of the Faversham Institute.
Gilford (Ireland) Young Men's Mutual Improvement Society	Dr. Henry McBride, M.D., Gilford, Co. Down, Ireland.
Glasgow Athenæum	Mr. John Allan, 13, Queen-street, Glasgow.
Glasgow Institution	Mr. John Craig, F.E.I.S., Glasgow Institution, 37, Cathedral-street, Glasgow.
Glasgow Mechanics' Institution	Mr. W. T. Duncan, 65, St. Vincent-street, Glasgow.
Glasgow Popular Evening Classes, Andersonian University	Mr. Geo. Martin, 11, Great Western-road, Glasgow.
Halifax Working Men's College	Mr. Geo. Gibb, Haley-hill, Halifax.
Hastings and St. Leonard's	M. J. Savery, 27, Marina, St. Leonard's
Hertford	Mr. J. L. Foster, and Rev. J. Davy, Hertford.

Hitchin	Mr. Joseph Pollard, High-down, near Hitchin.
Hull	Mr. P. Blackmore, Young People's Institute, Hull.
Ipswich	Mr. Edwin Barrett, 31, Cornhill, and Mr. Herbert Wright, 44, Handford-road, Ipswich.
King's Lynn	Mr. T. Burton, Checker-street.
Lancashire and Cheshire Union:—	
(Central Board)	Mr. Thomas Lawton, 3, St. James's-chambers, South King-street, Manchester.
" Accrington	Mr. W. Ratcliffe.
" Alderley Edge	Mr. G. W. Railton, Alderley Edge.
" Ashton-under Lyne	Mr. D. F. Howorth.
" Bacup	Mr. Thomas Newbigging, Bacup.
" Blackburn	Mr. W. G. Prebble.
" Bollington	Mr. J. Gask, Useful Knowledge Society.
" Bolton	Mr. T. Barton.
" Burnley	Mr. J. H. Scott.
" Bury	Mr. C. M. Merchant.
" Chorley (Lancashire)	Mr. T. Yates.
" Clitheroe	Mr. J. Whitaker.
" Congleton	Mr. G. Pickford, Mechanics' Institution.
" Crewe	Mr. Thos. Stubbs.
" Dean Mills	Mr. W. Taylor.
" Droylsden	Mr. James Blackburn, Educational Institute.
" Farnworth (Bolton)	Mr. W. Scrimgeour, Farnworth.
" Freetown (Glossop)	Mr. David Taylor, Edward-street, Glossop.
" Galgate (near Lancaster)	Mr. W. Parkinson.
" Haughton Dale	Mr. J. F. Fallows.
" Hyde	Mr. W. Gee.
" Macclesfield	Mr. W. Jeffery, Park-green, Macclesfield.
" Manchester M.I.	Mr. A. Jarrett.
" Mossley	Mr. Thos. Jackson.
" New Mills (near Stockport)	Mr. John Haslam, Working Men's Institute.
" Newton Heath	Mr. S. L. Chadwick.
" Oldham Lyceum	Rev. J. Hodgson.
" Oldham Science School	Rev. W. Walters.
" Over-Darwen	Mr. A. Bradbury, Mechanics' Institution.
Pendleton	Mr. J. Harrop, Mechanics' Institution.
" Preston	Mr. James Dunn, Mechanics' Institution.
" Rusholme Public Hall and Library	Mr. E. Wilde.
" St. Helen's	Mr. W. Thomason.
" Salford	Mr. W. Noar.
" Southport	Mr. J. H. Tonge, Athenæum.
" Stalybridge	Mr. E. B. Newton.
" Stockport	Mr. S. Robinson, Mech. Inst.
" Tottington (Bury)	Mr. J. Greenhalgh.
Leeds Young Men's Christian Association	Mr. W. H. Smith, Y.M. Christian Assoc., Leeds.
Leicester	Rev. D. J. Vaughan, St. Martin's Vicarage, Leicester.
Lichfield	Rev. Thomas Dainty, Lichfield.
Liverpool College	Mr. J. Gregory Jones, College, Shaw-st., Liverpool.
Lockwood	Mr. Alfred Lee, Mechanics' Institute, Lockwood.
London, City of London College, Sussex Hall, London, E.C.	Mr. W. H. Hansen, City of London College, Sussex Hall, Leadenhall-street, E.C.
London, Royal Polytechnic Institution, Limited	Mr. James Cousens, Royal Polytechnic Institution.
" St. Stephen's, Westminster	Mr. J. Cawood, St. Stephen's School, Westminster.
London, Metropolitan Association:—	
" Bayswater	Mr. C. Baker, 15, St. Petersburg-place, Bayswater, W.
" Clapham	Mr. T. Heller, Clapham.
" Hackney	Mr. H. Gray, Working Men's Inst., Triangle, Hackney.
" Lambeth	Mr. T. Heller, Hercules'-buildings, Lambeth, S.
" Mechanics' Institution	Mr. T. A. Reed, 41, Chancery-lane, W.C.
" Notting-hill	Mr. T. Timson, James-street, Notting-hill, W.
" Paddington	Mr. B. Shaw, 8, Cambridge-square, W.
" St. George's & St. James's, Westminster	Revs. P. S. Duval, G. B. Macilwain, & Mr. G. Pickett.
" St. Margaret's and St. John's	Mr. V. Borradaile, St. Mary's Parsonage, Vincent-sq.
" St. Thomas, Charterhouse Evening Classes	Mr. G. Phillipson, St. Thomas' Charterhouse School.
" Spitalfields and Bethnal-green	Mr. T. N. Day, Abbey-street School, Bethnal-green, N.E.
" Stepney Deanery	Mr. W. F. Ives, St. John's School, Limehouse.
Louth	Mr. Benjamin Crow, Mechanics' Institution, Louth.
Newcastle-on-Tyne Church of England Institute	Mr. M. J. Forster, Maple-terrace, Newcastle-on-Tyne
New Swindon	Mr. W. L. Fallows, Mech. Inst.
Paisley	Mr. Charles Dalton Wason, Teacher, St. George's School, Paisley.
Pembroke Dock	Mr. T. H. Eastlake, H.M. Dockyard, Pembroke Dock.
Peterborough	Mr. C. T. Cotton, Long-causeway, Peterborough.
Poole	Mr. J. E. Rogers, Young Men's Christian Association, Poole
Portsmouth	Mr. A. R. Robinson, 198, Lake-road, Landport.
Richmond	Rev. W. Bashall, A.M., 3, Cambridge-villas, Richmond-hill, S.W.
Slough	Mr. James Chapman, Upton-grove, Slough.
Southampton	Mr. W. Johnson, Athenæum, Southampton.
South Staffordshire Union of Educational Institutions	
" Bilston	Rev. J. W. Bain.
" Cradley-heath	Mr. S. Griffiths.
" Dudley	Mr. Smith, Mech. Inst.
" Gold's Hill	Mr. Thomas Crabtree, Gold's Hill Schools, West Bromwich.
" Kinver	Mr. T. Bolton, Hyde House, Stourbridge.
" Oldbury	Rev. H. B. Bowlby.
" Pensnett	Mr. J. Crompton, Holly Hall Schools, near Dudley.

South Staffordshire Union (continued)	
„ Smethwick ..	Mr. F. Talbot, Messrs. Chance's Library, Smethwick.
„ Stourbridge ..	Mr. John Taylor, land agent.
„ Walsall......	Rev. J. H. Sharwood.
„ Wednesbury..	Mr. C. Britten, Market-place.
„ West Bromwich	Rev. J. Whewell.
„ Willenhall ..	Mr. J. Bennett.
„ Wolverhampton.........	Mr. J. N. Langley, Mowbray House, Wolverhampton.
Wakefield	Mr. W. S. Banks, solicitor, Wakefield.
Waterford	Mr. James Budd, Thomas-street, Waterford.
Wellingborough	Mr. Thomas S. Curtis, Wellingborough.
West Hartlepool	Mr. Thos. Preston Brunton, and Mr. John Thomas Belk, solicitors, West Hartlepool.
Whitby	Mr. W. G. Chiesman.
Wigan	Mr. James Seward, Church-street, Wigan.
Woolwich	Mr. W. D. Keeble, Royal Laboratory, Woolwich.
Worcestershire Union of Educational Institutes	Rev. E. Isaac, Hanley Castle. Mr. F. Marcus, organising master, Worcester.
York	Mr. R. Hall, 8, Fossgate, York.
Yorkshire, West Riding Educational Board:—	
(Central Board)..	Mr. H. H. Sales, Mechanics' Institution, Leeds.
„ Acomb, near York	Mr. T. Copley, Acomb.
„ Beeston (Leeds)	Mr. W. Standeven.
„ Calverley	Mr. Alfred Walton.
„ Eccleshill	Mr. J. T. Baxter, Eccleshill.
„ Farsley, near Leeds......	Mr. Arthur Kirk.
„ Garforth (Leeds)	Mr. Arthur Woodhead.
„ Halifax Mechanics' Institution ..	Mr. A. C. Foster, Solicitor, 1, Westgate, Halifax.
„ Hebden Bridge	Rev. W. Baldwin, M.A., Hebden-bridge.
„ Holbeck	Mr. Geo. Tinker.
„ Hunslet (Leeds)	Mr. W. Child, Powell-street, Hunslet.
„ Keighley	Mr. C. D. Hardcastle, Keighley.
„ Leeds, Church Institute ..	Rev. J. F. Wood.
„ „ Mechanics' Institution..	Mr. J. O. Dayson.
„ Middlesbro'-on-Tees....	Mr. W. Taylor, Mechanics' Inst., Middlesbro'-on-Tees.
„ Ossett	Mr. J. W. Greenwood.
„ Otley........	Mr. H. J. Newstead.
„ Queensbury (Halifax) ..	Mr. J. W. Quarmby.
„ Reeth	Mr. W. Wilkie.
„ Rotherham ..	Mr. W. Unwin, currier, Rotherham.
„ Scarborough..	Messrs. Thos. Shields and C. H. Moxey, Mechanics' Institute, Scarborough.
„ Slaidburn (Clitheroe)	Mr. T. D. Jackson, Slaidburn.
„ Stocksbridge (Sheffield)..	Rev. H. Robertshaw, Stocksbridge.
„ Stockton-on-Tees	Mr. T. W. Hornsby.
Yorkshire Union (continued)	
„ Thirsk	Mr. R. D. Carter, Thirsk.
„ Wilsden (near Bingley, Leeds)	Mr. C. Petty, Wilsden.

ELEMENTARY EXAMINATIONS.

The Society of Arts, ever since the establishment of its system of Examinations, has (while abstaining on its own part from examining students in elementary subjects) recommended the District Unions and Local Boards in connection with it, to hold Examinations of this character, as preparatory to the Final Examinations of the Society. In order to aid them in doing this, and at the same time to promote, as far as possible, a uniformity of standard all over the country, the following definite scheme of elementary examinations is recommended for the use of the District Unions and Local Boards. It is in two grades, and the candidates should be allowed to select either grade at their discretion.

LOWER GRADE.

1. Every candidate must be examined in the first four rules of Arithmetic, simple and compound.
2. Female candidates must also be examined in plain needlework.
3. Male candidates must also be examined in *one* at least of the three following subjects:—
   A. A General knowledge of the Gospel History.
   B. The rudiments of English History.
   C. The rudiments of the Geography of England.
4. Fairly good writing and spelling, with good reading of a simple narrative will also be required.
5. A satisfactory examination will entitle the candidate to a certificate (of the Lower Grade) from the District Union or Local Board.

HIGHER GRADE.

1. Every candidate must be examined in Arithmetic, including the Rule of Three, Decimal and Vulgar Fractions.
2. Every female candidate must also show proficiency in needlework.
3. Male candidates must also be examined in *one* at least of the four following subjects:—
   A. The facts of St. Mark's Gospel and the Acts of the Apostles.
   B. A General knowledge of English History, and especially of the reign of Elizabeth.
   C. The Geography of Great Britain and Ireland.
   D. English Grammar.
4. Candidates will be expected to write fairly, spell correctly, and express themselves grammatically.
5. A satisfactory examination will entitle the candidate to a certificate (of the Higher Grade) from the District Union or Local Board.

No candidates under 12 years of age should be admitted to either grade of these examinations.

The Secretary of any District Union or Local Board in connection with the Society of Arts, desiring to adopt this scheme of Elementary Examinations, must apply to the Secretary of the Society of Arts before the 1*st of February*, stating the number of *male* and *female* Candidates respectively desiring to be examined in *each grade*. Examination Papers* in the above subjects will

* The uniform Examination Papers afford a common standard of examination; and, to promote uniformity in the application of that standard, special copies of the examination papers, with the number of marks to be awarded for a complete answer to each question, will be printed for the use of the local examiners. Thus, suppose that in a paper there are twelve questions, and that the aggregate number of marks assigned to the paper is 120; the number of marks placed opposite to each of the questions will depend upon their relative difficulty, and the proportion of these marks given by the examiner for the answer of any candidate will depend upon its accuracy and complete-

then be forwarded to him, which of course must be kept secret from the Candidates until the time of the Examination.

These Examinations must, in 1867, be held on the 26th, 27th, and 28th February, after four o'clock, p.m., as follows:—

Tuesday, 26th February, After 4 p.m.	Wednesday, 27th February, After 4 p.m.	Thursday, 28th February, After 4 p.m.
Arithmetic.	English History.	Gospel History.
	Geography.	English Grammar.

The District Unions and Local Boards will understand that they or their own Examiners must look through the Candidates' answers, and award the certificates. When this has been done, a Return, in the following form, must be made to the Secretary of the Society of Arts, who will then forward the proper number of blank Forms of Certificate to be filled up by the Local Board:—

Elementary Examinations, 1867.

Name of Board or District Union. } ____________

No. of Centres ________

	Higher Grade.		Lower Grade.	
	Examined.	Passed.	Examined.	Passed.
Males				
Females				
Totals				

Any Candidate who has obtained a Certificate of the Higher or Lower Grade in these Preparatory Examinations in Elementary Subjects may, at the discretion of the Local Boards, if not less than sixteen years of age, be "passed" to the Final Examination of the Society of Arts in any of the *special* subjects in which his or her knowledge has been properly tested.

The Council of the Society of Arts, while desiring thus to aid local bodies in promoting elementary education, hope they will prevent the possibility of the elementary certificates awarded by themselves being confounded with the certificates awarded by the Society of Arts.

The foregoing Programme of Examinations is published in a separate form, and may be had *gratis* on application to the Secretary of the Society of Arts.

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ness. Supposing a perfect answer to a question to be set down as worth 20 marks, an examiner may award 20, 15, 12, or any less number, according to the merit of the answer. Thus the candidates all over the country, though their papers be tested by different examiners, will be placed as nearly as possible upon an equal footing. No candidate should receive a certificate who does not obtain at least 30 marks in *each* paper, the whole paper being worth 120 marks. In the subjects of reading, writing, spelling, and arithmetic, it is not thought desirable to fix any number of marks as a standard of proficiency. It is important that the same person should examine *all* the candidates in any one subject at any centre.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 25th July, 1866.

Par. Numb.
225. Bills—New Zealand.
233. " Railway Companies' Securities (as amended by Select Committee).
234. " Landed Estates Court, &c. (Ireland) (amended).
235. " Bills of Sale Act (1854) Amendment.
236. " Local Government Supplemental (No. 4).
237. " Aberdeen Provisional Order Confirmation.
238. " Inclosure (No. 2).
239. " Crown Lands (Lords Amendments).
320. Grand Jury Presentments (Ireland)—Abstracts of Accounts.
408. Record of Title Office, &c. (Ireland)—Correspondence.
424. Railway, &c. Bills—Return.
434. West African Mails—Contracts.
Jamaica (Disturbances)—Index to Parts I. II. and III.

Patents.

From Commissioners of Patents' Journal, July 27th.

Grants of Provisional Protection.

Air, compressing—1837—C. F. Dietrich.
Artificial fuel—1871—D. Barker.
Electric telegraph wires, holding suspended—1843—R. Johnson.
Fire, extinguishing—1723—D. and D. Dawson, and T. Breadbent.
Gas—1827—W. G. Walker and R. F. Smith.
Glass, articles of—1857—T. G. Webb.
Granular substances, mixing—1861—W. Thompson.
Hats—1863—J. Richardson and J. Yeomans.
Holders—1839—W. E. Wiley.
Horses, curbing—1847—G. Day.
Horses, unharnessing—1873—W. E. Gedge.
Lift hoist—1845—P. Ellis.
Liquids, raising and forcing—1717—W. E. Newton.
Locks, &c.—1865—W. B. Shorland.
Machinery, lubricating—1853—R. Clough and P. Smith, sen.
Mile posts—1877—J. and E. Goad.
Mills—1841—W. Thompson and T. Stather.
Motive power—1851—J. Ingamells.
Parturition, instruments for—1763—G. R. Sheraton.
Railways, working the points of—1875—J. J. L. M. Legarrique and P. A. Castera.
Screw cutting and threading machines—1219—C. D. Fox.
Ships' rudders—1833—D. Gallafent.
Spinning, mules for—1859—J. McVitie.
Twist and cord—1835—W. E. Newton.
Water, discharging—1855—J. L. Norton and F. L. H. W. Benge.
Woven fabrics, folding—1849—J., C., and H. Sampson.

Invention with Complete Specification Filed.

Gas—1888—M. A. F. Mennons.

Patents Sealed.

278. W. Hersee and G. Smyth.
280. B. Farmer.
282. W. R. Harris.
286. J. Robertson.
292. E. R. Wethered.
293. S. B. Ardrey, S. Beckett, W. Smith.
294. L. Sterne.
295. A. Smith.
296. J. Ingram and J. Gough.
304. C. Defries.
307. C. E. Giajola.
310. W. and J. Woodward.
317. T. Jenks.
324. D. Winstanley, jun.
340. E. Petite.
370. E. Price.
406. W. Clissold.
422. J. H. Burton.
426. J. Heggett.
430. J. Tomlinson.
463. F. R. Wheeldon.
487. C. Gall.
529. W. E. Newton.
638. W. Clark.
666. G. Davies.
673. W. E. Newton.
911. R. Nosko.

From Commissioners of Patents' Journal, July 31st.

Patents Sealed.

320. H. C. Lucy.
322. W. B. Nation.
323. J. J. and E. Harrison.
325. W. Boase.
327. W. J. Blinkhorn.
328. J. C. Patrick.
331. G. Barker and C. Davis.
332. H. Larkin and R. Purkis.
333. A. V. Newton.
337. W. Mackintosh.
345. F. B. Baker.
346. T. A. G. Willington.
347. C. V. Walker.
354. D. Spink.
369. U. Scott.
380. S. J. Sellfield.
407. J. Higgins.
413. J. Warner.
421. W. R. Lake.
425. B. W. Farey.
454. J. R. Fealy.
575. G. Haseltine.
657. John Bischoff.
1206. R. J. Bond.

Patents on which the Stamp Duty of £50 has been Paid.

1842. L. L. J. Fillion.
1846. M. Meisel.
1858. J. Boyd.
1888. W. and S. Firth.
1892. W. and J. Galloway.
1910. T. Fellows & H. Hemy.

Journal of the Society of Arts.

FRIDAY, AUGUST 10, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

National Musical Education.

The Council of the Society of Arts, having communicated to the Royal Academy of Music the First Report of the Musical Education Committee, already published in the *Journal*,* have received a reply from the Royal Academy, saying that "the Directors concur with the Committee in their views of the general principles on which a National Academy of Music should be established," and also "agree with the Committee in thinking that the endowment of a number of scholarships, affording the means for gratuitous instruction to young persons of superior musical talents, would be the most effectual mode of extending the usefulness of the Academy, and of placing it on a popular basis."

At a meeting of the Musical Education Committee, held on Wednesday, the 1st inst., the following minute was passed, and it has been received by the Council:—

1. It appears from the evidence that the Royal Academies of Music of Paris, Brussels, and Naples furnish instances of highly successful institutions, on an extensive scale, and present especially useful suggestions for the re-organization of the Royal Academy of Music. At Paris above six hundred out-door students, selected from all parts of France, are educated, and at Naples between two and three hundred students are trained. In both cases the education is gratuitous to the students, the expenses being paid by the state: at Brussels there are above 500 students whose expenses are defrayed partly by the state and partly by the municipalities.

2. The Committee are of opinion that a National Academy for the United Kingdom, its colonies and dependencies, should provide for the instruction of a certain number of students, supported by public funds, and a certain other number paying adequate fees. They consider that at present about two hundred students might be fixed as a proper number to receive gratuitous training, and that of this number one hundred, selected by public competition, should be supported by public funds disbursed under ministerial responsibility, the remainder if possible by colonial, municipal, or other corporate funds and by private endowments and subscriptions. Arrangements should then be made to allow about 100 private students in addition to enter and pay adequate fees for their instruction; but this number ought not to be allowed to outgrow the number of students in training without very careful consideration of the responsible managers.

* Present volume, p. 165.

3. The Committee are of opinion that as our colonies and India send many young persons to this country for general education, it might reasonably be expected that they would be induced to send persons having musical gifts for musical education if the training were as efficient as it might be.

4. So far as the Committee are enabled to judge from the evidence, they consider that the cost of properly training two hundred free students would be about fifteen thousand pounds sterling a-year, being at an average rate of seventy-five pounds a-year for each student; out of this sum grants for maintenance, at varying rates, might be allowed to the students, in accordance with the system which is found to work so successfully in the Art Training Schools at South Kensington. Some students might hold scholarships without receiving any maintenance allowance, and the Committee have reason to hope that private individuals will come forward and endow scholarships.

Proceedings of Institutions.

Droylsden Educational Institution.—The report of the directors, read at the last annual general meeting, held February 20, 1866, congratulates the members upon the increased facilities for educational purposes which have been afforded by the Institution, and upon the great measure of prosperity which has attended their efforts during the year. In former reports the directors have had to lament the depressing influence of the state of the staple trade of the district upon the progress of the Institution; but, happily, this unexampled gloom has now passed away, and the directors look forward with confidence to the future. In last year's report the directors had the gratification of announcing a considerable accession to the number of members; this year, however, they are happy to state that the increase has been much greater, the total number of members of all classes being 392, showing an increase of 72 since last year. In the library department considerable progress has been made, the number of readers and of books issued having largely increased during the year, the total issued being 2,759, showing an increase upon last year of 993. The average number of readers per month during the year has been 110. The total number of volumes at present in the library is 1,222, being an increase of 91 volumes during the year. The great success of the evening classes has been a remarkable feature in the working of the Institution during the year, the number of pupils in attendance showing a considerable augmentation. The re-opening of the classes for the season took place in October last, when upwards of one hundred prizes were presented to members of the elementary classes, and also valuable prizes of books and instruments to the members of the Chemistry class, awarded by the Science and Art Department, and by the gift of Robert Rumney, Esq., of Manchester. The prizes to the elementary classes were given for regular attendance and general progress during the previous season. Out of 14 members of the Chemistry class 11 passed the examination of the Science and Art Department successfully. The success of the Botany class was less favourable. Classes for the study of geometrical drawing, mechanical drawing, and building construction, have been formed, containing altogether about 61 members, and are in successful operation. The average attendance at these classes is very good. An elementary class of adult males has been formed, and is now working successfully, being superintended by two of the directors. The number of pupils attending the various classes is as follows:—Elementary classes—females, 137; do., males, 113; do., male adults, 11; Chemistry classes, 13; Drawing classes, 61; total, 335. A most important feature in the year's programme has been the course of twelve weekly lectures, which have been delivered on Monday evenings

during the winter. Among the subjects treated were:—"Town Life in New Zealand," by George Heppel, Esq., M.A., of Manchester; "Coal and some of its Products," by Robert Rumney, Esq., of Manchester; "Wonderful Things Revealed in Chemistry," by Thomas Lawton, Esq., of Manchester; "Yorkshire Wit amongst Yorkshire Roughs," by the Rev. J. V. B. Shrewsbury, of Manchester; "Personal Visits to the Battlefields of England," by the Rev. James Bardsley, M.A., of Manchester. At the annual soirée the attendance was very large and the proceedings satisfactory. The chair was taken by the president, who delivered an address to the members and their friends on the position and prospects of the Institution. Mr. Lawton, the agent of the Lancashire and Cheshire Union of Institutes, and Visiting Officer of the Society of Arts in that district, also attended and gave a most valuable address, pointing out to the young people present the advantages to be derived from their connection with Institutions of this class. During the winter a singing class was established, which had the use of the large room one evening in the week, but from the limited attendance it was not deemed advisable to retain the services of a teacher, as this would have entailed expense on the Institution. The Penny Bank has continued its successful career. The number of depositors has steadily increased, and the weekly amount deposited is now greater than in any former period, having latterly exceeded £5 per week. Notwithstanding the considerable amount withdrawn, and the increased sums transferred to the Post-office Savings Bank, the balance in hand has been steadily augmented, and now exceeds that at any previous date.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(Continued from page 590).

MINING AND METALLURGY.

THREE HOURS ALLOWED.

1. Describe the English process of manufacturing wrought iron from ordinary pig-iron.
2. In what way is copper obtained from sandstone ores, containing from 1½ to 2 per cent. of that metal?
3. Describe the Frieburg method of amalgamation.
4. Where are tin ores principally found, and how are they prepared for the market?
5. How would you extract the metals, in a country in which wood and charcoal are the only available fuel, from an ore containing 30 per cent. of lead, and 40oz. of silver to the ton of mineral?
6. Describe Bessemer's process for manufacturing steel.
7. Give the respective approximative compositions of Welsh coal, anthracite, and north country steam coal.
8. What amount of power will be expended in pumping per minute 800 gallons of water from a depth of 520 feet?
9. Describe the ordinary round buddle employed for slime dressing.
10. Describe the iron ores of the Cleaveland districts, and state in what geological formation they occur.
11. How would you determine the amount of ash contained in a specimen of coal?
12. Describe the method employed for making the survey of a mine in which the presence of iron interferes with the action of the magnetic needle.

BOTANY.

THREE HOURS ALLOWED.

The candidate is expected to answer correctly three questions in Section I. and six questions in Sections II. and III., including descriptions of at least two of the fresh specimens. Nos. 8, 9, and 10 each stand for an answer.

SECTION I.—STRUCTURE AND PHYSIOLOGY.

1. Define the following terms, and give examples in illustration as required.
Diadelphous. Give examples from two Natural Orders.
Orthotropous. Give two Natural Orders in illustration.
Circumscissile. Name fruits of genera belonging to two Natural Orders in illustration.
Accrescent. Give an example.
2. What are *Stipules?* In which British Natural Orders are they generally present? In which absent?
3. Explain the structure and function of *Leaves.*
4. What is the function of *Albumen?* Name six British Natural Orders which generally have *albuminous,* and six which have *exalbuminous* seeds.
5. Name the essential *elementary constituents* of plants.
6. What functions are liable to be interfered with in *transplanting?* And how is fatal disturbance to be guarded against?

SECTION II.—SYSTEMATIC AND ECONOMIC BOTANY.

1. State the principles upon which plants are *classed.*
2. Which natural orders furnish the following products? State the part of the plant affording each:—*Cotton, saffron, mace, colza-oil, arnatto, sugar.*
3. Distinguish *Rosaceæ* from *Leguminosæ.*
4. Distinguish the genera Oak (*Quercus*), Chestnut (*Castanea*), and Beech (*Fagus*).
5. Describe the usual structure of the flower in *Grasses.*
6. Describe the principal modifications of the *capitulum* and of the *fruit and its appendages* in British *Compositæ.*
7. Name the *Natural Order* to which the plants marked A. B. and C. respectively belong, with *reasons* for your opinion.

SECTION III.—DESCRIPTIVE BOTANY.

8, 9, and 10. Describe the three plants marked A, B, and C, in the proper sequence of their organs, and in accordance with the examples given in Lindley's "Descriptive Botany" and Oliver's "Lessons" (Appendix).

FLORICULTURE.

THREE HOURS ALLOWED.

1. What are the conditions most favourable to the germination of seeds?
2. Describe the process of budding, and point out in what respect it differs from grafting.
3. How and by what means, if at all, may hardier races of any particular kind of plant be obtained?
4. For what special cultural purposes are "span-roofed" and "lean-to" houses most suitable?
5. Suppose a conservatory has to be decorated at Christmas with flowers, some in their natural season, others forwarded or retarded by artificial treatment. Name a few of the leading plants which will naturally be in a condition to be used for that purpose, and name also some of the most important of those which would have to be prepared artificially, indicating in general terms the mode of preparation.
6. The showy Pansy of the garden is understood to have been produced from one of our wild pansies. Describe how this change can have been effected.
7. What are the conditions and processes, at the flowering stage of a plant, necessary to the production of fertile seed?
8. What system of treatment would be specially conducive to the production of abundance of blossoms, and what would be most conducive to a paucity of blossoms? Take greenhouse Azaleas and Pelargoniums as examples.
9. Name the principal decorative plants available for the garden, greenhouse, and stove, in the different months of the year, in establishments where both stove and greenhouse accommodation are provided.
10. How should forcing houses be ventilated, and for what reasons mainly is ventilation necessary in such structures—to which artificial heat, it is to be remembered, is being at the same time applied?

11. Describe the process of hybridizing plants, and the conditions necessary to a successful result—that is, the actual production of hybrids.

12. In what way is bottom-heat important in plant-culture, and how is it best applied?

(To be continued.)

THE PIAZZI MONUMENT.

The following letter, with enclosure, has been addressed to the Secretary of the Society of Arts:—

Science and Art Department, London, W.,
30th day of July, 1866.

"Sir,—I am directed by the Lords of the Committee of Council on Education to forward to you the enclosed copy of a translation of a letter received from the Executive Committee of the Commission appointed to erect a monument to Piazzi, the astronomer, as being likely to interest the members of the Society of Arts.

"I have, &c., "Henry Cole."

[Translation.]

"Sir,—The Commission elected by the free-town of Ponte di Vatellina, Lombardy, for erecting the proposed monument to Piazzi, the astronomer, having determined to apply to the authorities, and persons of rank, in various places where the great astronomer had given proof of his estimable character and scientific attainment, has considered it right to address to you and the Professors of the Institution with which you are connected, a request for a subscription in aid of this excellent object, for it was in England especially—that country so well deserving of liberty and progress—that Piazzi, honoured by the friendship of the learned men of the day, laboured in conjunction with Jesse Ramsden, the great astronomical discoverer; and it was at the Observatory of Greenwich that he observed the solar eclipse of 1788. It was to one of the most illustrious scientific bodies of England—the Royal Society—that the great man dedicated his famous 'Catalogue of the Stars;' and on the ground of this combination, so to say, of Italian and English fame, and of the traditional generosity of the free people of England, we appeal to you, in reference to this movement of ours, respectfully requesting that you will give it your support in the scientific institutions of your celebrated city.

"We are, &c., the Executive Committee:—
"Professor B. E. Mirmeri, President.
"Professor Gicciardi, Vice-President.
"F. Patrizi.
"Ortensio Piazzi.
"L. Marchedi.

Ponte di Vatellina, 30 April, 1866.

PATENTS.

It appears, from the report of the Commissioners of Patents, that in the year 1865 there were 3,386 applications for patents, and 2,186 patents in fact passed the seal; rather more than a third of the applications were not proceeded with. Of the patents actually sealed, about 70 per cent. became void at the end of the third year by non-payment of the £50 stamp duty then payable, and about 90 per cent. of the remainder became void at the end of the seventh year by non-payment of the £100 stamp duty then payable to secure the patent for a second term of seven years. The receipts of the Patent-office in the year 1865 amounted to £115,340. The fees to the Attorney-General and Solicitor-General and their clerks absorbed £10,118; compensations, £4,554; the general expenditure, £32,154. After further deducting what are regarded as "revenue stamp duties" there remained £47,324 surplus income for the year. It is not considered that the fees are too heavy; a material reduction would tend to increase the number of useless and speculative patents, often taken merely for advertising purposes. But the offices and the establishment having become quite inadequate for the work to be done, it is represented that the surplus income of the department, now applied in increasing the public revenue, should be appropriated to the erection of suitable patent offices, library, and museum, the latter to serve as a historical and educational institution for the benefit and instruction of skilled workmen; and the Commissioners of Patents annex to their report this year a plan for the appropriation to this purpose of Fife-house and gardens in Whitehall, abutting on the Thames Embankment.

The reports made by Messrs. Greenwood and Hindmarch last year propose also that the offices of Clerk of the Patents and Clerk of the Commissioners be abolished, and that the Chief Clerk should be a person of skill, who could at once give to the law officer the information necessary to enable him to determine whether a provisional specification sufficiently describes the nature of the invention, and whether it is one for which a patent ought to be granted—a course by which many grants of patents for frivolous inventions would be prevented, and more definite information would be obtained respecting the nature of inventions sought to be patented. The Commissioners report that the preparation and publication of classified abstracts or abridgments of the specifications from the earliest period to the present time continues; and copies of these (each set of the Patent-office publications including upwards of 2,000 volumes) have been presented to the authorities of every important town in the kingdom on condition of their being daily accessible to the public free of charge. It is estimated that above 80,000 more abridgments have to be made to complete the work to the present time. Messrs. Greenwood and Hindmarch suggest that in future the specifications should be abridged as they come into the office. An alphabetical index to French patents has been made in the English language, and a general index to the scientific periodicals in the library, and it is suggested that these, if printed, would be found of great value to the public.

EXTRACTING THE PRECIOUS METALS BY MEANS OF SODIUM AMALGAM.

The extraction of gold by amalgamation has been attended hitherto with serious difficulties, owing to the presence in the ore of sulphurets, arsenic, antimony, bismuth, or tellurium compounds, which coat the gold with a film of tarnish, so that the mercury cannot touch it. Again, with many minerals the mercury is "sickened," its fluidity is destroyed, and it becomes either a tenacious mass, or it assumes a powdery character. In each case, its amalgamating action is almost destroyed. The result is, that from 30 to 80 per cent., or more, of the gold escapes the action of the mercury, being lost in the "tailings," whilst large quantities of the mercury are also carried off in the washings.

The following figures, extracted from official documents, show the percentage of gold constantly being lost at some of the most important gold mines in different parts of the world:—

At the St. John del Rey mine the loss of gold is......	30	per cent.
In the Brazils generally....	30 to 35	„
In Piedmont..............	35	„
At Zell..................	35 to 40	„
In Hungary and the Tyrol..	50	„
In Chili..................	66	„

In many cases the waste of mercury is even more serious than that of gold.

The new process discovered by Mr. William Crookes, F.R.S., is stated to possess the following advantages:—By the judicious admixture of a certain proportion of sodium, &c., with the mercury, its amalgamating powers, under all circumstances, are preserved and intensified. It will extract gold from sulphurets and other minerals which have hitherto resisted the ordinary process; it

will seize upon gold so tarnished that it would otherwise pass untouched through common mercury, and be lost in the tailings; it will prevent absolutely the "sickening" and "flouring" of the mercury, conditions which mar the extraction of the gold; and, finally, the yield of gold is greatly augmented, and a considerable saving in mercury is effected.

When some or all of the above-mentioned minerals are present with the gold (and specially if the latter occurs with pyrites), the mercury in which the ore is triturated or ground, becomes "floured," "granulated," or powdered, *i.e.*, it becomes subdivided into excessively minute globules, which, owing to the film of tarnish they have contracted, refuse to reunite, and are consequently washed away, it being almost impossible to effect their separation from the heavier portions of ore by any known process.

The presence of some of these minerals affects the mercury in another way, viz., by "sickening" it. "Sick" mercury has lost its fluidity, and will not flow with a bright surface, neither will it touch gold except with great difficulty. The ill effects of "sickening" are not so great as those of "flouring." "Sick" mercury can generally be restored by distillation, when not much is lost: the chief objection being that it will not take up gold from the ore; but "floured" mercury is not only entirely lost, but it carries away with it all the gold which it already may have taken up.

Another very serious loss is the following:—Even when the mercury preserves its bright metallic condition, and is in the most active state ever met with in commerce, it will seldom take up more than half or two-thirds of the gold present in the ore, owing to the precious metal being naturally tarnished on its surface and resisting the action of the mercury except when they are ground together for a longer time than is usually practicable.

All these sources of loss are said to be avoided by dissolving a little sodium amalgam in the mercury before it is introduced into the amalgamating vessels. The best proportion of amalgam to the mercury must be found out by experiment, as nearly every kind of ore will require a different treatment; but considerable latitude is permitted, and the addition of a little too much does not appear to do harm. It is recommended that one part by weight of amalgam be dissolved in thirty parts of the mercury which is to be used in the gold amalgamating vessels or triturating or grinding machines, and the effect which it produces on the mercury noted from time to time during the operation. If the mercury retain its fluidity and brightness to the end of the operation, it is a sign that either sufficient or too much has been added, and a second experiment should be tried with the addition of a diminished quantity of amalgam. But if it be "floured" or "sick," or any be lost, amalgam may be added, until the best proportion is arrived at.

In many gold mining works, it is found advantageous to employ amalgamated surfaces of copper, over which the crushed ore, tailings, and slimes, or such materials are allowed to flow; or to introduce amalgamated copper plates into the triturating and grinding machines. By this means some of the gold and floured mercury, which otherwise would have been lost in the tailings is collected on the copper, and may be scraped off from time to time. The adoption of this principle will be found of great use in all gold and silver amalgamating works, in which the extensive adoption of amalgamated metallic surfaces is recommended for the riffle boxes, launders, shaking and percussion tables, floors, or other parts along or over which the crushed ore, tailings, slimes, or such material flow.

By employing the amalgam in coarse powder and sprinkling it over the wetted metallic surface which it is wished to amalgamate, and then rubbing it over with a little clean mercury, a firmly adherent and brilliant coating of mercury will be given to the metal. Not only can copper be amalgamated in this way, but the same result is produced on galvanized iron (iron coated with a thin layer of zinc), or tin plate (iron coated with a thin layer of tin), on lead, and less perfectly on iron and steel. In all cases it is advisable to preserve the effective surface and the amalgamating energy of the mercury on the metal plates by an occasional sprinkling of powdered amalgam applied from time to time as required.

This process is also applicable to silver ores. The causes of loss in silver amalgamation are—1, the "flouring" or powdering of the mercury owing to the mechanical treatment it undergoes; 2, the "sickening" of the mercury, owing to the presence in the ore of certain deleterious minerals; and, 3, the chemical change of the mercury into corrosive sublimate and calomel, which it undergoes in the act of reducing the chloride of silver to the metallic state.

The employment of the amalgam in conjunction with the mercury is intended as a remedy for each of these evils. By dissolving in the mercury some of the amalgam, in the proportion of two parts of amalgam for one part of silver present in the ore, all these evils are stated to be prevented. The chlorine goes to the other metals present, instead of to the mercury, and the decomposition takes place so rapidly, that an operation which formerly would take a week is sometimes finished in 12 hours.

The following experiments may be made to show the special action of sodium amalgam upon "floured" and "sick" mercury, and upon gold and silver ores:—

1. Take a piece of dry chloride of silver and put it in a watch glass or small dish. Cover it with water and put a globule of mercury of about its own bulk in contact with it. The two may be rubbed together for hours without any apparent change taking place, but if a piece of either of the amalgams be dropped into the mercury, the latter will seize hold at once upon the chloride of silver and in a few minutes will appear to have eaten its way through, reducing it to the metallic state, and at the same time amalgamating with the silver.

2. Take about five grains of pure mercury and put it into a small dish or a watch glass. Pour over it a few drops of solution of perchloride or persulphate of iron. This will "sicken" the mercury readily, especially if it be moved about with the finger. When thoroughly "sick," drop into it a piece of amalgam, about one-hundredth part the size of the mercury. Instantly, as if by magic, the "sick" mercury recovers, and assumes its globular form.

3. Sicken another globule of mercury in the same manner. Pour on to it the recovered mercury from the former experiment (No. 2), and it will be seen to cure the second portion also.

4. Thoroughly flour or powder a dozen grains of mercury by violently shaking them in a bottle with weak gum-water and a few drops of perchloride of iron. Pour off the liquid and wash once or twice. Now transfer the powdered mercury to a dish, and put into it a few gains of amalgam, and gently rub them together under water. In a few minutes the whole of the mercury will be reduced to the bright metallic state. Mercury floured and sickened with grease will be brought back to the active state with the same readiness.

5. Take two portions of pure mercury (about [illegible] grains each). Pour water over them, and put ten grains of amalgam into one of them. Now take a piece of gold ore, containing visible gold in it, and dip it into the common mercury. Scarcely any, or no, action will take place. Then dip the same piece into the amalgamated mercury, and the latter will instantly unite with the gold and whiten it. A gold coin dipped into common mercury will seldom be acted upon except in a few spots, but when dipped into the amalgamated mercury it is instantly wetted by the metal over its whole surface. The same experiment may be performed with a silver coin and a piece of gilt paper.

5. Take some iron pyrites and mix with it any of the ores which are most antagonistic to amalgamation by the ordinary process, such as arsenic or tellurium ores (if these cannot be got they may be left out). Grind up

100 grains of this mixture with 5 grains of pure mercury and a very little water for about two minutes, and then wash away the pyrites and examine the state of the mercury which is left behind. Nearly all will be washed away, and what is left will be in the form of a dull-looking powder or flour.

7. Now repeat the same experiment after having added to the mercury a small piece of amalgam. The mercury will be kept in the bright globular condition during the whole of the experiment, and upon washing away the pyrites, the metal will be left behind in one globule, without loss.

If the pyrites or other mineral contain gold, the amalgamated mercury will be found upon examination to have absorbed it all, whilst the common mercury will have taken up scarcely any.

In reference to this process Dr. A. W. Hofmann, F.R.S., after bearing testimony to its efficacy, says:—"The phenomena witnessed in comparative experiments, made with ordinary mercury, and with mercury to which a very small amount of sodium amalgam had been added, were truly startling. Under circumstances in which ordinary mercury rapidly lost its fluidity and globular form, the metal containing sodium retained them unimpaired; and mercury which had become entirely altered, regained its fluidity and globular character by the addition of a small amount of sodium amalgam, almost instantaneously. A gold coin which could be dipped for a few moments into ordinary mercury without being attacked in the slightest degree, was instantaneously covered with mercury when a small bit of sodium amalgam had been added to the metal. Auriferous quartz, with visible spangles of gold, exhibited exactly the same deportment. The advantages that must accrue in a commercial point of view are to my mind undoubted. Through this discovery it will now be possible to obtain a greater percentage of gold than heretofore from any given ore; and as regards the poorer auriferous ores, it will now be possible, by the elimination of these two important sources of loss, to work them also remuneratively."

Dr. Wm. Allen Miller, V.P.R.S., gives an equally favourable opinion of the process.

Dr. Frankland, F.R.S., says:—"In the processes for extracting gold and silver by amalgamation, the mercury becomes 'floured,' or 'sickened,' which causes it to be more or less carried away and lost. The mercury so washed away carries with it all the gold or silver which it has taken up. This loss Mr. Crookes prevents by the addition of an amalgam of sodium. In the native state gold and silver are always coated with a film, which prevents the contact of these metals with mercury, except after long grinding, in consequence of which large quantities of gold and silver are always being washed away in the 'tailings.' Mr. Crookes attains the necessary contact by the addition of a trifling percentage of sodium amalgam."

Dr. Odling, F.R.S., and Mr. Robert Hunt, F.R.S., also speak favourably of this process.

Some experiments which were made at the gold-bearing districts in Wales, by Mr. Readwin and Mr. Spence, tend to show that even in cases where no gold whatever was obtained by the ordinary process, the sodium process yielded upwards of 6 oz. of gold per ton.

Mr. Thomas Belt, manager of the Prince of Wales Gold and Lead Mine, Dolgelly, who has had very considerable experience in gold mining in Nova Scotia, has used the sodium process with great success in extracting gold from galena by amalgamation. The assay of the galena showed that it contained 13 dwts. 16 grains of gold per ton. Amalgamation in the ordinary way with common mercury only extracted 6 dwts. 12 grains of gold per ton, whilst when the amalgamation was conducted with the addition of a very small quantity of sodium amalgam the whole of the gold present was recovered, the yield being 13 dwts. 10 grains per ton.

A series of experiments with sodium amalgam in the treatment of auriferous ores has been conducted under the superintendence of Professor Silliman. Having at his disposal a considerable quantity of Californian gold quartz from a mine in Calaveras county, he subjected these ores to this method of amalgamation, and the results show that with unaided mercury the gold saved is less than 60 per cent. of the whole quantity of gold known to be present. In one experiments less than 40 per cent. was saved, while by the aid of the amalgam of sodium the saving is increased to 80 per cent. With regard to the mode in which the sodium acts, Professor Silliman remarks "that the action of the sodium in this case appears to be in a manner electrical, by placing the mercury in a highly electro-positive condition towards the electro-negative gold. The quantity of sodium is entirely too small to allow of the supposition that it acts by its chemical affinities. The use of the sodium amalgam for silver amalgamation must depend upon a like power of electrical action to that seen in its action on gold, and also to the well-known power of preventing the granulation (flouring) of mercury, or of saving the mercury when thus changed. Indeed, there is good reason for believing that a most important part is played by the sodium amalgam in this last particular."

The new process has been in use for some time at the gold mines at Clear Creek, Tulare Country, California, where the owners report that the quicksilver is rendered remarkably quicker and livelier for absorbing the particles of gold, by the immersion of small lumps of sodium. It has also been successfully employed in Mexico, at the Works of the Real del Monte y Pachuca Silver Mining Company (one of the largest silver mines in the world), and the St. John del Rey Gold Mining Company (Brazils) have also commenced experiments, upon which they report favourably.

RAVAGES BY INSECTS IN THE COTTON FIELDS.

The year 1866 will be memorable for the mischief done by insects in many parts of the world; the visitation of locusts in Algeria is, at present, the most terrible case recorded; but we hear from nearly all parts extraordinary accounts of the devastation caused by one kind of insect or another. In France, grasshoppers are unusually numerous and large, and some have been seen of a size that recall the locusts of hotter countries. In many places in the south the mosquitos are said to have become a perfect pest, and all over the country flies and other insects are vexatiously abundant.

Accounts from Louisiana state that the cotton crop is in danger of being eaten up by the army worm. It is impossible to form an idea of their numbers, says an observer, without witnessing the destruction which they cause. Their fecundity renders the case truly alarming; each female produces about five hundred eggs, and supposing that there is only one female insect to the acre, there will be five hundred caterpillars in six days; and, supposing half these to be females, in twenty days or so more there will be 125,000, and as the cotton plants are planted in the proportion of five thousand to the acre, there would be twenty-five insects on each plant; and these again would, in three weeks more, be increased five hundred fold.

Two years ago the planters of Louisiana, tempted by the high price of cotton, which was then selling at fifteenpence a pound, began to cultivate cotton, which had been almost abandoned. The sugar cane became of secondary importance. The soil was turned up with the avidity of gold seekers; old debts and mortgages would be all paid off with one good harvest of cotton. The terrible caterpillar has arrived, and has swept away the hopes of the planters in a few days. Fortunes that were half made have disappeared like snow before the

sun, and growers who refused to sell their growing crops have now scarcely anything left to sell. The noise made by these multitudes of voracious insects is described as audible at the distance of a mile, and to resemble the crackling of a house on fire, and the planter suffers sensations akin to those of unfortunate people whose houses are in flames.

It was thought for a long time that the army worm only visited Lower Louisiana, but this was an error; in 1788, these insects destroyed 280 tons of cotton in the Bahamas; they caused the cultivation of cotton to be given up in many of the West Indian Islands, and the case was almost the same in Egypt; in 1793, this insect visited Georgia, and in 1800 it ravaged South Carolina; four years later they descended on the whole of Louisiana; and in 1825 they ravaged the whole of the Southern States, and it was very difficult even to get seed for the following year. The last general visitation was in 1845. The army worm appears often in Guiana and other parts of South America.

The mischief done by these creatures is, fortunately, not always of the same serious extent; sometimes even the insects, when they come late, as they did last year, thin the seed pods, and produce a positive benefit. If it were not so, considering that they have appeared twenty-three times in the United States since 1793, the growing of cotton would be hazardous to be continued.

It appears, from long and careful observation, that the most favourable circumstances for the production of the army worm are heat, moisture, and clouded skies, up to the end of the month of June; when such is the case the visitation is looked upon as certain; it was so this year. The caterpillars cannot support great heat and continued drought; in Louisiana and the other states of the South, as well as in the Bahamas, a torrid summer kills them, especially where the soil is sandy. In 1826 the creatures appeared on the 1st of August in Louisiana and North Carolina, but hot weather set in, and by the 23rd of the same month they had all disappeared.

PARIS CONSERVATOIRE OF MUSIC.

The annual competition of the pupils of the Conservatoire commenced on the 12th and was concluded on the 28th of July. The following notes will show the number of competitors in each class, and also that of the prizes and honours awarded in each:—

In the class of counterpoint and fugue there were twelve candidates for honours; the awards were, a first and a second prize, and three accessits or honourable mentions.

In harmony there were thirteen candidates; no first prize was awarded, but one second prize and three accessits.

For the organ prize there seem to have been but five candidates, but the competition is said to have been brilliant; there were awarded, a first prize, a second-first prize, a second prize, and three accessits. The five laureats were all pupils of M. Benoist, who originated the organ class of the Conservatoire more than forty years ago, and has won for it a high reputation.

In the clavier class there were no less than thirty-six competitors, and the awards were, seven first, six second, and six third class medals. The theme chosen for the exercise was Hummel's "Concerto," in A minor.

The pupils in the class of Solfeggio were very numerous; the exact number is not reported; there were awarded, in the male class, eight first, seven second, and seven third class medals; in the female class, fifteen first, thirteen second, and eleven third class medals—in all sixty-one awards.

In thorough bass there were given a first, second-first, and second prizes, and a second accessit—all the prize-men being the pupils of M. Labro.

In harmony and accompaniment there were awarded, in the male class, a first and a second prize, and three accessits; and in the female class, the like awards.

All the above classes compete in private before the jury, the pupils being young, and consequently timid.

The public competitions commenced with the singing classes, and there were forty-six candidates—twenty-one in the male and twenty-five in the female class. A first and second prize and three accessits were awarded in each case. The jury was composed of M. Auber (president), MM. Ambroise Thomas, G. Kastner, Édouard Monnais, Boïeldieu, Massé, Pasdeloup, Colin, and Wekerlin.

The candidates for the prizes in tragedy were only six in number, three male and three female pupils. The first prize was awarded in the male class; the second prize was divided between two competitors; and none was given in the female class. Second and third accessits only were awarded in the male, and first and second accessits in the female class.

In comedy there were given—in the male class, a first prize, divided between two pupils, a second prize, and three accessits; and in the female class—a first prize, also divided, two second-class prizes, and three accessits.

The piano competition is always very important, and was more than usually so this year. The morceaux selected for the young men consisted of fragments of the 1st morceau of the 5th concerto of Henry Herz. There were sixteen competitors, and the prizes awarded were two first prizes, resulting from a unanimous vote of the jury, a second prize, and first and second accessits. The female class did not produce such brilliant examples as the male class, but the average was pronounced to be superior, although the competitors were exactly twice as numerous. The morceau chosen for the trial was Hummel's concerto in A flat. Three first and one second prizes, and three accessists, each of which was divided between two pupils. The laureats were all pupils of Herz, Mathias, Marmontel, Lecouppey, Lecallo, and Madame Farrenc.

In the harp class there were but two competitors, both male, and pupils of M. Prumier the elder, of whom one obtained a second prize, and the other a second accessit.

The competition in comic opera is eminently popular, and is generally well sustained. There were, on the present occasion, eight male and ten female candidates. The first prize, in the male class, was awarded to M. Devoyod, a pupil of M. Couderc, who had selected the character of *Pygmalion*, in "Galatée;" the second prize was divided between two pupils of M. Mocker, who gave the second act of "L'Eclair" and the "Nouveau Seigneur;" three accessits were awarded. The other pieces given were "Le Postillon de Longjumeau," and the "Chanteuse voilée." In the female class, Mdlle. Séveste, daughter of a former director of the Théâtre Lyrique, and pupil of M. Mocker, was unanimously awarded the first prize, for her rendering of a scene of "Fior d'Aliza," and her participation in the "Nouveau Seigneur;" the second prize was between two competitors, who played *Henriette* in "L'Eclair," and *Catarina*, in the "Diamants de la Couronne." There were also awarded a first accessit, a second accessit, divided between three pupils, and three third-class accessits; the parts being from the "Barbiere," "Domino Noir," the "Postillon," and the "Caid." The jury consisted of MM. Auber, A. Thomas, Kastner, Edouard Monnais, Cabanis, De Leuven, Bazin, Jules Cohen, and Wekerlin.

The prizes in grand opera were disputed by twenty-one candidates, of whom nine were male and twelve female. The first prize in the former class was awarded to M. Devoyod, who obtained also the first prize for comic opera; he gave a scene from "Charles VI." Two second prizes were given to pupils who rendered scenes in "Othello" and "Charles VI.;" there were also awarded a first and second accessit, the pieces being the trio from "Guillaume Tell," and the second act of the same opera. The female class did not obtain a first

s, but three second prizes were awarded, the pieces extsd being from the "Prophète" and the "Trovatore;" a first accessit to a pupil who performed the chater of *Alice* in "Robert le Diable." In all there were nty acts or scenes performed. The jury consisted MM. Auber, A. Thomas, Berlioz, G. Kastner, E. nnais, E. Perrin, Carvalho, Victor Massé, and Georges inl.

Fine Arts.

A Case of Copyright.—A trial for infringement the copyright of an engraving took place some time e in Paris, which presents some features deserving of ice. The work of art in question was a well-known ture by M. Pils, of Roger de Lisle singing the Marseillaise" before the Maire of Strasbourg. The sessor of the copyright of the engraving of this pice cited the designer, printer, publisher, and printer of a lithograph, for having infringed his copyht. The painter of the original, M. Pils, was called a witness, but declared that he was not interested either side; he said that he saw no resemblance been the lithograph in question and his picture, ough he thought the designer had approached rather near to his composition, but neither the figures nor ir attitudes were copied or imitated. The only reserve had made in disposing of the right of engraving to plaintiff was, that his work should not be reproduced screens, chimney-boards, or other commercial objects. e President suggested to M. Pils that the composition l simply been reversed, but the latter thought this of le importance when the attitudes and faces were not rowed. The Court, however, took a different view the matter, and, while acquitting the defendants of ring counterfeited the engraving of the plaintiff, ided that the latter had acted in perfect good faith in sing the seizure of the lithograph in question, and missed the case without costs. The matter was howr taken, by appeal, to a higher court, by which the ision of the former tribunal was reversed. The Court d that there was infringement of copyright, not only en a work was servilely copied, but also when there s partial reproduction, and the borrowing of a portion the original work; that the lithograph in question ibited the same distribution and action of the perages in the composition; that the chief figures were same in both productions, and were grouped in the e manner; that the attitude of Roger de Lisle, his s, and sword, were absolutely identical; that there s servile imitation as regarded two of the figures, as l as in the back of a chair in the fore-ground, and in nerous accessories; that it was evident that the ughtsman of the lithograph had the original enving in his eye, and, not content with drawing his piration from the original work, had copied it as reded both the general form and numerous details, and only avoided close resemblance in order that the cy should not be too flagrant; rescinded the judgnt of the lower court; ordered the defendants to pay sum of 500 francs to the plaintiff, by way of damages, the lithograph and stone to be given up to him, and demned the defendant in the costs of both suits. should be observed that the Ministerial prosecutor not interfere in the case, so that the matter was deed on the civil action only. Had the Procureur-Imial interfered the defendants would probably have n condemned to pay a further sum by way of fine for infringement of the laws.

Popular Election in Matters of Art.—The academy Beaux Arts of Bruxelles has followed the example of French administration in the introduction of the ular element in connection with matters of art. The y for the admission of works of art and the distribun of prizes at the triennial exhibition of fine arts has, for the first time, been elected by the whole body of exhibiting artists. The result, as regards the intentions of the electors, is excellent. The list of jurors is as follows:—In painting: MM. Verlat, Slingeneyer, Hallaert, Dillens, and Quinaux. In Sculpture: MM. Simonis and Jacquet. In Architecture: M. Suys; and in Engraving M. Franck; all eminent artists. An unfortunate accident occurred, however, in the section of sculpture. M. Vandenkerckhove obtained 17 votes, M. Simonis 14, and M. Jacquet 13; but a part of the balloting tickets bore the Christian name, Auguste, and the others Augustin; and the scrutineers declared that they could not be counted in favour of the same candidate. This decision seems most extraordinary, for there is but one known Belgian sculptor who signs himself Aug. Vandenkerckhove. Several artists immediately protested against the decision of the scrutineers, and M. Vandenkerckhove has since addressed a letter to the Minister of the Interior demanding a new election. This is an unfortunate *contretemps*, but in no way affects either the principle of such elections or the judgment of the artists who placed at the head of the poll the best names in Belgium. The experiment thus adds another great argument in favour of the artistic franchise.

Art in Belgium.—It is proposed to decorate the Academic Hall of the free University of Brussels in a sumptuous manner; the paintings to be in *fresco*. The cost is estimated at £6,000, two-thirds to be furnished by the Government, and the remainder by the municipal authorities.—The Royal Museum of Antiquities of Brussels has acquired three collections, containing a great variety of samples of decorative papers of the 17th and 18th centuries, the production of an ancient manufactory of the country. There existed at Malines, in the 17th century, if not earlier, a manufacture of ornamental papers for covering books and other similar purposes, and, at a later period, for the decoration of apartments. The Government is taking active measures to render the technological section of the museum as complete as possible in drawings and samples illustrative of the ancient industries of the country, such as the manufacture of various kinds of Brussels, Malines, Grammont, and Ypres, and of the old stamped or impressed leather work, known as Cordova hangings.

Manufactures.

Purification of Drinking Water.—Mr. Alfred Bird, of Birmingham, has just brought out a plan for purifying water taken from rivers, ponds, tanks, and wells. The principle upon which the plan is founded is the known affinity which hydrated alumina has for organic matters, in combining with them and rendering them insoluble. Mr. Bird states the action as follows:—One part of neutral ter-sulphate of aluminium in solution is added to seven thousand parts of the water to be purified. As soon as the mixture is made, a cloudy haze is seen in the water, which haze rapidly condenses into flocculi, with little lanes of clear water of the greatest brilliancy and beauty between them. As the flocculi become more dense they rapidly descend to the bottom of the water, leaving it absolutely free from all organic colouring matter, as clear as crystal, and free from taint. The time required for complete precipitation is from six to eight hours; if, therefore, the precipitant be put in over-night, the water will be ready for use in the morning; and as time for the action to take place, and not quantity of water, is the consideration, ten thousand gallons can as quickly be purified by this process as a single gallon. The chemical action is thus described:—The lime which is in solution in the water as a carbonate combines with the sulphuric acid of the ter-sulphate, and forms sulphate of lime. The liberated hydrate of alumina instantly attacks the organic matter, which it renders insoluble,

and both rapidly descend to the bottom of the water, with the nearly insoluble sulphate of lime, while the liberated carbonic acid gas which remains in the water imparts to it a sparkling freshness and beauty. As the liberation of the hydrated alumina depends on the presence of carbonate of lime in the water, and as its absence in terrestrial waters is a most rare occurrence, the applicability of this patent for the purification of terrestrial waters may be said to be universal. Mr. Bird states that, in order to test the effect of the precipitant upon very dirty water, a gallon was taken out of the Thames at half-tide, in the centre arch of London-bridge. Into this water was put twenty drops of a standard solution of the precipitant. The water was then allowed to stand eight hours, when it was found that all the filth had settled to the bottom, and the supernatant water was clear, sparkling, and pleasant to drink. To test the superior salubrity of water which had been purified with the precipitant over the same water which had not been so purified, the following experiments were tried:—Into each of three glass jars was poured half a gallon of the purified water. In the first were placed thirty leeches, in the second two splendid gold fish, and in the third a fresh-cut bunch of water-cress, without any roots attached. The experiments were tried in the summer; the glass jars stood in a good light, and it was found that the leeches remained healthy in the water after it had stood eight days; the gold fish lost none of their vigour though the water was unchanged three days, while the cut and rootless water-cress looked green, and actually sprouted new leaves on the surface of the water after it had stood seven days. The glass jars were now emptied, and half a gallon of the same water, which had not been purified, put into each, with the same leeches, gold fish, and a fresh bunch of water-cress without roots. The glass jars stood in the same position as before, and it was now observed that the leeches on the third day began to die; the gold fish looked sickly on the second day, and it was absolutely necessary to change the water in their jar on the third day to keep them alive; as to the water-cress, on the third day the leaves began to bleach; on the fourth day the stems felt slimy and began to soften; and on the fifth day the jar had an unpleasant smell, owing to the decay of the plant. To test the possibility of there being any organic life left in the purified water, a gallon was put into a glass bottle, and the bottle placed in the sunlight; beside it was placed a similar bottle of water which had been taken from a deep well. In about a month the well water showed distinct green patches of vegetable life, while the water which had been purified with the precipitant remained as clear as crystal, and without a trace of vegetable matter, at the end of six months.

PRESERVATION OF MEAT.—Professor Redwood has invented a process, which consists in the immersion of fresh meat in melted paraffin, at a temperature of 240° Fahr. (115° centrigrade), for a sufficient time to effect a concentration of the juices of the meat and the complete expulsion of air; after which the meat, in its condensed state, is covered with an external coating of paraffin, by which air is excluded and decomposition prevented. The concentration of the juices may be thus carried to any required extent. If the meat is to be kept in hot climates its weight should be reduced by evaporation to about one-half, in which state it will contain all the nutriment of twice its weight of fresh meat, the portion driven off by evaporation consisting only of water. Thus prepared it will be fully cooked (by the heat applied in the process), and it may be eaten without further preparation, but it will also be applicable for the preparation of made dishes, including stews, hashes, soups, gravies, &c. For cold climates a less amount of heating and concentration it is considered will suffice, so that the meat may retain its original juicy condition, and, when further cooked, present the appearance, and possess all the characters, of fresh unpreserved meat. The paraffin is entirely free from taste and smell, and is not subject to change from keeping. It may be removed from the surface of the meat by putting the latter into a vessel containing boiling water, when the paraffin as it melts will rise to the surface of the water, and may be taken off in a solid cake when cold, while, at the same time, the meat will become softened and prepared for cooking in any suitable way. Among the advantages of the process may be mentioned its great simplicity, the facility with which it can be performed by unskilled workmen, and its inexpensive character, as the same paraffin can be used for an indefinite number of times, and the quantity required for coating the meat is very small. When the meat is concentrated, as described for hot climates, it is rendered very portable, and no special care is required in packing it. Professor Redwood is now taking steps for having the process tested in South America on an extensive scale. A specimen of the meat preserved by this process has been deposited at the Society of Arts.

COLD BLEACHING PROCESS.—M. Tessié du Mothay and M. Rousseau describe very satisfactory trials which they have made of a cold bleaching process, by means of which all textile materials, whether silk, cotton, linen, flax, wool, or any woolly fibre, can be bleached. The agent employed is permanganate of soda, slightly acid, prepared by a new and economical process. With this salt, the extraordinary properties of which have of late years been much studied, a bath is prepared, in which the materials to be bleached are dipped. They are stirred about with a glass rod from time to time, and after about ten minutes they are taken out of the bath, strongly coloured of a violet brown hue by an abundant deposit of oxyde of manganese. They are then dipped as quickly as possible in a bath of water, acidulated with sulphurous acid, and again stirred and turned over with a glass rod, and after two or three minutes the materials or thread, originally of yellow or grey colour, are already white. These operations are repeated twice more, and the result is a brilliant white, whilst the fibres are in no way injured. The materials operated upon were cotton fabrics, dirty as they came direct from the loom, as well as skeins of linen thread of a dark slate colour, which by existing processes would have taken many days to bleach.

ROAD TRACTION-ENGINES.—The first of a number of traction-engines, required by the Ottoman Carrying Company, has recently been turned out by Messrs. Dübs and Company, locomotive works, Glasgow, from designs of Mr. D. K. Clark, C.E., embracing the Bray driving-wheel and many points of novelty. The engine is intended for service in Syria, between Damascus and the port of Beyrout, a journey of 68 miles, across mounts Libanon and Anti-Libanon, and is to carry ten tons of goods over steep inclines of 1 in 12, and others scarcely less steep, at the rate of from three to five miles per hour. This engine differs in several important particulars from the ordinary construction of traction-engines. These have for the most part been made, as a *sine quâ non*, cheap, after the model of the common portable-engine for agricultural purposes, combining the means of occasionally taking a load across a field or along a country road with the means of driving machinery. But in the new engine, which is supported on bearing springs, a strong frame is constructed expressly to carry the boiler and the whole of the machinery, and to bear all the stress and fatigue incidental to the hauling of heavy loads on common roads. By means of a compact differential motion the engine is enabled to turn the quickest curves, with a train behind it, with the greatest facility, the outer driving-wheel being, by self-acting means, enabled to revolve faster than the inner one, as in an ordinary carriage or waggon; thus the whole tractive power of the engine is available in turning the curves, getting rid of the stress and loss of power caused by the inevitable slipping and grinding of engines not so fitted. The machinery is arranged horizontally beneath the boiler, and thus a very simple and compact system of

framing has been matured. The Bray teeth, which are applied to the driving-wheels, are formed hollow, so as to receive the thrust of the teeth-rods inside, and thus avoid the tilting action of a thrust on end. By means of these and other specialities, Mr. Clark has endeavoured to combine great strength and lightness with efficiency and durability, at the same time that the cost is moderate. The engine carries 500 gallons of water and 15 cwt. of coal; and when tested with the regulation load of 10 tons, carried in two waggons, over the steep inclines of the Cathcart-road, near Glasgow, she ran at an average speed of four and a half miles per hour, going and returning, the prevailing gradient being 1 in 13½, on a macadamised surface. The maximum speed was about six miles per hour, equal to that of a London four-wheel cab. The engine has been solidly constructed, of the best material and workmanship, and has been beautifully finished, to the great credit of the young but already celebrated firm of Messrs Dübs and Co. This, the first traction-engine constructed for the Ottoman Company, is named the "Abdul Aziz."

Commerce.

Orchid Tea.—An account of this product, quoted from the *Gardener's Chronicle* has already appeared in the *Journal*.* It is much prized by the natives of the place where it grows for its valuable properties, and is called by them Faham or Bourbon tea. No specimens of this tea have at present appeared in any of the London shops, but it seems to be pretty well known in Paris, where it can be readily procured at a reasonable rate. Messrs. Travers, in their circular, say—"We have had an opportunity of tasting it, and although we can never hope to agree with the natives of Réunion and Mauritius, who actually, it is said, prefer it to the Chinese plant, still we must own that the flavour is far from disagreeable, and under certain conditions the beverage might be rendered very palatable. Much, of course, depends upon the way in which it is infused. The tea may, in trade phraseology, be described as having an exaggerated Kaisow flavour; it has a flat, open, untwisted leaf, mixed with the stalks of the plants, and an agreeable smell, like that of new-made hay. The flavour is certainly peculiar, and from the single sample we have tasted, we should be unwilling to pronounce a decided opinion on its merits, but it is such that we can understand persons who are accustomed to it relishing it extremely. In the circulars issued by Messrs. Bousquin, Galerie Vivienne, Paris, the house which has imported Faham, its superiority to tea and coffee is said to consist in its soothing properties, in cases of cold and similar affections, and in its not causing sleeplessness—an important advantage to many. We are not in a position to say anything as to these properties, having merely tasted it with a view of ascertaining if indulgent nature had really bestowed upon mankind another substitute for the fragrant Chinese herb. With the class of teetotallers we apprehend it will meet but little favour, as, in addition to milk, the employment of alcoholic liquors, more especially of rum, is particularly recommended in order to draw out the flavour more effectually. One decided advantage it certainly has over our ordinary tea, and that is, that any quantity put aside to cool, will, when warmed up again, have all the flavour, freshness, and strength of the original decoction. It must not be forgotten, too, that it is essential to drawing out the proper qualities of this tea that it should be boiled, not made by infusion."

French Imports and Exports.—A comparative statement of the French imports and exports for the first six months of the present year shows that the total amount of imports is 1,593,500,000f., being an augmentation of 312,498,000f. as compared with the corresponding six months of last year. The exports amount for the same period to 1,778,644,000f., against 1,390,520,000f. in 1865, showing an increase of 388,124,000f. in favour of the present year. The *Avenir Commercial* observes, on these returns, that M. Thiers should now be convinced, and probably is convinced, that the experiment of free-trade is more advanced than he supposed some time ago. The protectionists had always contended that whenever there was a monetary crisis in England, France would be deluged with English products to the utter ruin of the French manufacturer. The discount has since the middle of May been at 10 per cent., and France has no more been deluged with English manufactures than drained of her precious metals, in spite of the enormous difference in the rates between the two countries. The value of the exports in grain and flour has been, for the first six months of the present year, 122,252,000f., whereas, during the same period last year it was but 36,921,000f. One of the items which indicates most clearly the thriving condition of French industry is that of coals. The import of this article for the first six months in each year was:—1862, 49,001,000f.; 1863, 50,331,000f.; 1864, 55,171,000f.; 1865, 62,182,000f.; 1866, 70,392,000. The export for the same period was:—1862, 1,510,000f.; 1863, 1,742,000f.; 1864, 1,999,000f.; 1865, 1,834,000f.; 1866, 3,015,000f. The export of woollen tissues was:—1861, 83,332,000f.; 1862, 91,353,000f.; 1863, 125,195,000f.; 1864, 167,123,000; 1865, 151,335,000f.; 1866, 197,693,000f.

* Present vol. p. 448.

Colonies.

Intercolonial Exhibition at Melbourne.—The magnitude of this undertaking has involved the erection of a very large building, so that it will be scarcely possible to be opened before the 1st October. It is to remain open for three months, till January 14, 1867, thus giving more time for the several local exhibitions already organised. The mineral treasures are to be exhibited below ground, instead of in the ordinary way, for which is to be constructed a gallery or tunnel, having ascending or descending shafts, worked as hydraulic lifts, capable of taking 12 to 15 people down at once. The tunnel to be 50 to 100 feet long, lined with various minerals, and divided into sections, showing the characteristic formation of each deposit. The shafts to be about 50 feet deep, and the tunnel to be lighted with gas and the magnesium light. By communications received from the Tasmanian Commissioners satisfactory preparations appear to be being made in that colony. The Commission, numbering sixteen of the leading names in the island, have had a grant of £500 placed at their disposal by the Tasmanian Government, for the carrying out of the objects of the undertaking. New South Wales does not appear to have taken any official steps, although, amongst individuals, some stir is becoming perceptible. Exception, however, must be made in favour of the districts of Clarence and Richmond, the northern portion of New South Wales, which proposed to hold a preliminary exhibition at their head-quarters, Grafton, at the end of May. The vocabularies and accompanying explanatory and suggestive address by the President, have now been widely circulated amongst those considered to be the most competent recipients, and favourable answers have been received from some of the gentlemen thus addressed, cordially endorsing the views of the President, and promising their valuable aid in the work; and in one district, that of Corandêrik, a number of the aborigines have notified an intention of becoming competing exhibitors in the articles of opossum skins, rugs, baskets, &c. The principal object of the exhibition appears to be to bring together the principal articles intended to be sent to the Paris Exhibition next year.

Endeavours are making to get the several colonies to unite and form a great Australian department at Paris. South Australia has already consented to this, and it is expected the other colonies will also agree to combined action. At Brisbane the local exhibition of the products, &c., of Queensland, which were to be forwarded to the Intercolonial Exhibition at Melbourne, and thence to Paris, was opened on the 15th May. The display was small, but more exhibits were expected. Cotton, woods, marbles, and silks, were the prominent articles. Mrs. Timbrill showed thirteen boxes of raw silk. This lady received a prize from the Victoria Board of Agriculture in 1862, and a medal at the Dublin Exhibition in 1865, and the silk specimens then shown are now in the South Kensington Museum. In Western Australia Governor Hampton had nominated a commission to insure a due representation of the natural products of the colony, fully appreciating the importance of a design so well calculated to unfold the resources of the several parts of Australia. In Tasmania the sum of £500 has been voted by the Government for the Melbourne show. Among the articles to be exhibited are iron ore, coal, marble, building stones, gold, copper, slate, wool, grain, timber, boat-building, casks, saddlery, pipe-clay, wines, vinegar, cider, preserves, aboriginal weapons, photographs, colonial grown silk, the wild flowers of the colony in wax, and the fruits in plaster. In Victoria £2,000 has been voted by the Parliament for the Paris Exhibition, and Sir Redmond Barry appointed special executive commissioner. The quantity of grain agreed to be shown in Melbourne and at Paris is to be one bushel. It is also arranged that the ordinary length of specimens of timber is to be four feet, but as some of the woods are particularly fine, they will be shown on a larger scale. Large collections of plaster models of fruit, coloured from nature, will be shown by all the principal colonies, and collections of photographs, embracing the leading subjects in architecture, local scenery, &c. In Natal an influential committee has been formed, and the following articles are intended to be sent. Map of the colony, meteorological tables, photographs and drawings, furniture, &c., made of various kinds of wood, colonial and native pottery, leather work, basket work, &c. Silk, woollen, and cotton fabrics, coloured wools; marble, coal, iron ore, pottery clay, copper ore, plumbago, &c.; wood in slabs; resins and gums; bird skins, animal skins, horns, vegetable wax, cotton, flax, wool in grease, cocoons, tobacco and Kafir snuff, castor oil seed, ground nuts, medicinal barks and roots, &c.; felloes, yokes, spokes, axles, waggon chests, &c., harness made of colonial leather; lime made of marble, slate; wheat, flour, barley, rice, maize, maize flour; preserved fruits, fruit and vegetable seeds; colonial rum, brandy, wines and beer, and other colonial products of interest or commercial value, which are to be dispatched not later than the beginning of November.

Farming in New South Wales.—Among the witnesses examined before a select committee appointed by the colonial Parliament to inquire into the state of the colony, only one was a practical agriculturist, but as he has farmed continuously for 20 years, and through many colonial vicissitudes, his evidence has considerable value. Mr. J. U. Oxley has farmed 1,000 acres of land in the county of Cumberland; his experience is that he has found the pursuit moderately profitable, and, on the whole, has made a living out of it, but he has found his mill more profitable than his farm. His farming was more profitable before the discovery of gold than it has ever been since. The wages of labour enter so largely into the cost of production, that the rise therein has been a greater obstacle to profit than bad seasons. In one year he obtained from the ground an average crop of 25 bushels to the acre from 250 acres, and the price of wheat ranged from 4s. to 7s. per bushel, but the sale yielded him no profit. Before the discovery of gold farm labourers could be had for 2s. 6d. and 3s. per day, now they cost 4s. 6d. per day. This makes it difficult for those who have to depend on hired labour to farm at a profit. The tendency of such a state of things is of course to throw the farming into the hands of those who farm small plots, and find the labour within their own families. This, according to Mr. Oxley, is especially the case with maize, which requires a great deal of labour. The only remedy he sees is high farming, and he thinks it will pay to farm a smaller area, and to farm it better. He admits that colonial farming, as a rule, is very slovenly, and that he himself is very much behind the English agriculturists. Irrigation and drainage, Mr. Oxley thinks, would both pay, but they of course require a large investment of capital. Not much of the land in the county of Cumberland is appropriated to the fattening of store stock, whether from want of enterprise, or because it will not pay, is not clear. Fat stock, sent down the Hunter, realise prices that might seem to make it profitable to fatten stock nearer the metropolis.

The Wheat Crop in South Australia has been very poor in some places, having yielded only 8¾ bushels per acre. Last year it yielded 11 bushels, and was considered very poor. A large quantity of land which was sown for wheat was cut down for hay. The high price of hay towards the close of last year induced many farmers to cut down their young wheat. Taking the whole of the districts it appears that the returns give 3,587,246 bushels as the yield for the harvest, as compared with 4,252,949 bushels, the yield of the former one. Of course, as population has increased, a greater quantity will be required for home consumption and for seed. 160,000 people, at six bushels per head, which is considered a fair estimate for home consumption, will require 960,000 bushels. Then the seed-wheat, at a bushel and a-half per acre, for 450,000 acres, which is not too high an estimate, will take 675,000 bushels more, making a total for home requirements of 1,635,000 bushels. Reckoning 45 bushels to a ton of wheat-flour, there will be about 434,000 tons for export this year.

The Queensland Loan of 1864, amounting to £1,019,000, is to be applied as follows:—Immigration £100,000; railways, £847,000; telegraphs, £10,000, public works, £47,000; advances to corporations £15,000.

Publications Issued.

Fire Prevention and Fire Extinction. By James Braidwood, first superintendent of the London Fire Brigade, and Associate of the Institution of Civil Engineers. (*Bell and Daldy.*) This work comprises Mr Braidwood's experience of nearly forty years as head of the London and Edinburgh Fire Brigades, and treats of fire-proof structures, fire-proof safes, public fire brigades, private means for suppressing fires, fire engines, fire annihilators, portable fire escapes, water supply, &c. The editor in his preface says:—"The appearance at the beginning of last year, in the annual report of the Institution of Civil Engineers for 1861 and 1862, of a short memoir of Mr. Braidwood, suggested the publication of a more extended account of the life of the late head of the London Fire Brigade, combined with his opinions upon the subject of his profession. These opinions are comprised in a work on "Fire Engines, and the Training of Firemen," published in Edinburgh in 1830; two papers upon cognate subjects, read before the Institution of Civil Engineers, two similar papers read before the Society of Arts, and in a variety of reports upon public buildings, warehouses, &c. While regretting the great loss that the public has sustained, in being deprived by Mr. Braidwood's sudden death of a complete record of his long and varied London experience, it has been considered advisable to republish the above materials arranged in a systematic form, omitting only such parts as the author's more matured experience

rendered desirable, but confining the whole to his own words." There is an appendix on steam fire engines and the Metropolitan Fire Brigade, which brings the information on these subjects up to the present date.

A Prize Essay on the Detached Lever Escapement, by Moritz Grossman, which received an award of thirty guineas from the British Horological Institute, has been published in the *Horological Journal* (*Kent and Co.*, Paternoster-row), for June, July, and August; and a book containing twenty-six lithographic diagrams, with various tables of proportions, by the same author, illustrative of the Essay, has been issued.

On the Application of Disinfectants in Arresting the Spread of the Cattle Plague. By William Crookes, F.R.S. (*J. H. Dutton.*)—This is taken from the "Appendix to the Third Report of the Cattle Plague Commission," and is a reprint of the elaborate report made by Mr. Crookes, who was employed by the Commission to investigate the action of certain disinfectants in reference to the cattle plague poison. The Commissioners say—"Disinfection, in the sense in which the word is used here, implies the destruction of an animal poison, in whatever way it is accomplished. To find a perfect disinfectant for the cattle plague poison would be to stop the disease at once. We have naturally been very desirous of discovering a substance with such a power; but much more evidence is necessary before we can venture to affirm that success has been obtained. In the first instance we requested Dr. Angus Smith to undertake this subject, with a view of seeing what chemical agent would be best suited for the purpose. Subsequently, at his suggestion, Mr. Crookes was asked to carry on various practical trials, which might test the efficacy of two agents which Dr. Angus Smith had reported to us as likely to be useful. * * * On examining different agents it is soon found that the number of those which can be employed with advantage is limited. Since the poison is constantly given off in discharges flowing from diseased surfaces, and since it may be suspended like impalpable dust in the air, it becomes necessary that any disinfectant should act continuously both on the discharges and on the air. No disinfectant can be efficacious if its action is intermittent, or if it does not act on both sources of danger. It is evident, indeed, that the poison ought to be destroyed at the very moment of evolution or discharge. Every minute during which it remains active increases the danger. The disinfectant must, therefore, not only be both fixed and volatile, but so cheap and easily used as to be continually in action, and it must of course be innocuous to cattle and men. A large number of substances which can be used in many other cases as disinfectants must be put aside, as not meeting these necessary conditions. Compounds of iron, zinc, lead, manganese, arsenic, sodium, lime, or charcoal powder, and many other substances, want the volatile disinfecting power; iodine, bromine, nitrous acid, and some other bodies are too dear, or are entirely volatile, or are injurious to the cattle. On full consideration, it appears that the choice must lie between chlorine, ozone, sulphur, and the tar acids (carbolic and cresylic). Two of these bodies, viz., chlorine, in the shape of chloride of lime, and the tar acids, have the great advantage of being both liquid and aëriform; they can be at once added to discharges, and constantly diffused in the air. All these four substances—chlorine, ozone, sulphur, and the tar acids—have been practically tested, either in England or on the Continent, and there is considerable evidence that they all actually do destroy the cattle plague poison. Their precise mode of action is still uncertain. Chlorine and ozone act, no doubt, as powerful oxidisers, converting animal poisons into simple and innocuous substances. Sulphurous acid probably destroys the virus by its strong antiseptic powers. The tar acids, according to the experiments of Mr. Crookes, neither interrupt nor accelerate oxidation, but they act most powerfully in arresting all kinds of fermentative and putrefactive changes, and annihilate with the greatest certainty all the lower forms of life. After a full consideration of the relative merits of the four disinfectants, and after some practical trials, Mr. Crookes arrived at the conclusion that the most powerful, and at the same time most simple, process of disinfection would be to use the tar acids as constant liquid and aëriform disinfectants, and sulphur in the form of sulphurous acid as an additional and occasional agency. * * * The general result of experiments on disinfection with carbolic acid and sulphur is certainly very encouraging. For the reasons stated in Mr. Crookes's report, it appears that chloride of lime is inferior to the combined use of carbolic and sulphuric acids. But there is no doubt of the efficacy of this agent, and in certain circumstances, as for the washing of railway trucks, it may be employed in addition to boiling water or steam. It is very desirable that the use of carbolic acid should become general throughout the country in uninfected as well as in infected districts. There is little doubt that even were there no danger from cattle plague, the great purifying effect of this substance on the air of cattle sheds would contribute greatly to the health of the animals."

Notes.

Labourers' Dwellings.—A copy of rules and regulations with reference to loans to be made towards the erection of dwellings for the labouring classes under the 29th Vic., c 28, has just been issued from the Parliamentary Paper-office. Mr. M'Cullagh Torrens has given notice next session to move for leave to bring in a bill to provide better dwellings for artisans and labourers.

Pneumatic Despatch Company.—The report of the directors of this company states that previous to the meeting in January last, the directors reported that the delay in the carrying out of the Holborn viaduct would render it necessary for the tube to be carried under the existing streets and over the Fleet sewers, which it was hoped would have been avoided by the construction of the viaduct; and pending the consideration and final settlement of these points, the directors had determined to test the cost and facility of working by a series of carefully recorded experiments which were then in progress. Those experiments having now been fully carried out, the directors are perfectly satisfied with the results, from which it appears that 120 tons of goods can be passed through the tube per hour, at the rate of eighteen miles an hour, at the cost of under 1d. a ton per mile. The directors have also ascertained from statistical information furnished them by the directors of the London and North-Western Railway Company, that the line of tube, when completed, will return a large per centage on the capital expended on its construction. After such satisfactory results, the directors made overtures to the London and North-Western Railway Company to assist them in completing the line, which overtures were most favourably received.

The Atlantic Cable.—At a recent meeting of the Academy of Sciences at Paris, a conversation took place on the subject of the Atlantic cable, when M. Babinet, after expressing great doubt as to whether the cable would be lasting, said we ought at least to make it available for a useful purpose. He recommended that we should profit, and that at once, by the electric cable which unites the New World and Valentia, to determine the exact longitude of the American station.

Metropolitan Railway Improvement.—The new omnibuses of the Metropolitan Railway Company have commenced running from the Portland-road station to Regent-circus, for the convenience of travellers on the railway. Passengers can book through from any station on the Metropolitain line to Regent-circus, and *vice versa*.

The omnibuses are intended to carry 40 passengers, 23 outside and 17 inside. The interior is divided transversely into two compartments. The back compartment is entered in the usual way at the end of the omnibus, and appropriated to the reception of second and third-class passengers. The front compartment is fitted up for the accommodation of first-class passengers. There are places for umbrellas, and bell-pulls in each compartment for stopping. The first-class compartment is entered by doors placed on each side of the carriage between the fore and hind wheels, so that passengers can step off the footway into it without going into the roadway. There are two flights of steps and brass rails at the end of the omnibus to ascend to the seats on the roof for sixteen second and third class passengers. There is also a seat across the top, immediately behind the driver, and also on each side of him, for seven first-class passengers. The omnibus is drawn by three horses.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 26th July, 1866.

Par. Numb.
241. Bill—Public Libraries Act Amendment (amended in Committee, and on Re-commitment).
419. Cattle Plague—Nine Orders in Council.
423. St. James, Clerkenwell—Correspondence.
428. East India Communications—Report.
437. Lambeth Workhouse—Correspondence.
436. Civil Services—Supplementary Estimate.
East India (Railways)—Report by J. Danvers, Esquire.

Delivered on 27th July, 1866.

240. Bills—Common Law Court (Fees and Salaries).
242. „ New South Wales and Van Diemen's Land Government.
243. „ Oysters Cultivation (Ireland).
244. „ Fortifications (Provision for Expenses).
380. Jamaica—Letter, &c.
404. Post Office—Comparative Statement.
435. Enfield Rifles—Report.
Enfield Rifle (Snider's Method)—Further Reports.

Delivered on 28th July, 1866.

245. Bills—Naval Discipline (amended).
247. „ Extradition Treaties Act Amendment.
248. „ Law of Capital Punishment Amendment.
406. Public Income and Expenditure (1866)—Account.
431. Trade in Animals—Report from Select Committee.

Delivered on 30th July, 1866.

224. Bills—Constabulary Force (Ireland).
246. „ Dockyard Extensions.
249. „ Pensions (Lords Amendment).
250. „ Prisons.
251. „ Cattle Diseases Prevention Act Amendment (No. 2).
252. „ Ecclesiastical Commission.
418. Tramways (Ireland) Acts Amendment Bill—Report, Evidence, &c.
443. Cattle Plague—Two Orders in Council.

Delivered on 31st July, 1866.

68 (vi). Trade and Navigation Accounts (30th June, 1866).
126. Small Tenements—Return.
336. Terminable Annuities—Return.
349. Superior Courts of Law—Return.
401. Coinage—Account.
444. Oxford University—Two Statutes.
379. Edinburgh Annuity Tax Abolition Act (1863)—Report.
Extradition Treaty (France)—Correspondence.

Delivered on 1st August, 1866.

253. Bills—Public Health (as amended by the Select Committee, and on Re-commitment).
255. „ Expiring Laws Continuance.
412. Civil Contingencies Fund—Accounts.
438. Distillers, &c.—Return.
448. Expiring Laws—Report of Committee.
Colonial and other Possession—Statistical Abstract for 1851 to 1864 (Number 2).

Delivered on 3rd August, 1866.

279 (I). London (City) Corporation Gas, &c., Bills—Index to Report.
447. Piers and Harbours (Ireland)—Case.
453. Houseless Poor (Metropolis)—Return.
Public General Acts—Caps. 53 to 57.

Delivered on 4th August, 1866.

327. County Treasurers—Abstract of Accounts.
460. Saint Stephen's Green (Dublin) Bills (1864, 1865, and 1866)—Return.
465. Railways (Guards' and Passengers' Communication) Bill—Special Report.
466. Eastern Mails—Report from Captain Tyler, R.E.

Delivered on 6th August, 1866.

259. Bills—Indemnity.
260. „ Railway Companies' Securities—Lords Amendment.
371. Gas Companies (Metropolis)—Accounts.
445. North American Mails—Correspondence.
446. Registry of Deeds (Ireland)—Memorials.
456. National Education (Ireland)—Correspondence.
461. Orange Meeting (Ballykilbeg)—Correspondence.
469. Workhouses (Metropolis)—Circular.

Patents.

From Commissioners of Patents' Journal, August 3rd.

GRANTS OF PROVISIONAL PROTECTION.

Acids, obtaining—1885—R. Irvine and P. Brash.
Anchors—1536—C. T. Julius.
Cast iron, refining—1933—J. Livesey.
Enamelled paper, polishing—1921—W. E. Newton.
Envelopes, fastening for—1879—D. M. Gilbert and L. A. Dubreu.
Envelopes, gumming and printing—1556—W. E. Newton.
Fibrous materials, steeping, &c. 1881—W. Tongue.
Fire arms, removing exploded cartridges from breech-loading—18[illegible]—H. A. Bonneville.
Furnaces, combustion of fuel in—1658—J. Abbot.
Furnaces, consuming smoke in—1901—R. Newton.
Gasaliers—1889—F. J. Rowley.
Lamps—1907—A. Magnin.
Leather for boot fronts, crimping—1821—A. V. Newton.
Liquids, imbibing—1895—W. Bellamy.
Machine wires—1772—W. McAllum.
Materials, uniting—1762—T. Cook.
Metal cartridges—1656—J. G. Tongue.
Metallic structures—1891—H. Smith.
Metals, shaping—1903—R. Mitchell.
Motive power engines—1927—H. Prince.
Motive power, obtaining—1909—J. Ramsbottom.
Motive power wheels—1899—A. B. B. V. Rathen and G. H. Ellis.
Ordnance, receiving the recoil of—1935—J. Vavasseur.
Paraffine wax, refining—1905—J. Leach.
Piano and music stool, a convertible—1806—J. Millward.
Pianofortes—1883—A. N. Wornum.
Railway carriages—1923—W. E. Kochs.
Ships of war—1925—F. Palmer.
Steam, producing—1913—G. T. Bousfield.
Surfaces, coating—1805—A. V. Newton.
Tanning—1915—G. Mountford and G. L. Loversidge.
Weaving—1929—J. Boeddinghaus.
Weaving, looms for—1931—H. Lea and T. Lane.
Woods, dyeing—1937—W. E. Newton.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Firearms—1932—H. Calisher.
Fuel—1971—G. T. Bousfield.

PATENTS SEALED.

362. E. A. H. Beuther.	386. J. Townsend.
365. T. J. Smith.	421. W. S. Riley.
368. R. Sims, J. Beard, & R. Burns.	606. W. E. Newton.
372. W. Richards.	616. W. E. Newton.
376. J. A. Maxwell.	784. E. Tonks.
377. A. Clark.	815. H. B. Barlow.
381. J. Sawyer and S. Middleton.	1532. A. V. Newton.

From Commissioners of Patents' Journal, August 7th.

PATENTS SEALED.

402. R. W. Armstrong.	450. T. Whitley.
403. F. T. Baker.	471. J. and J. K. Seaman.
404. J. Rock, jun.	472. R. Napier.
410. T. Clift.	484. P. Ward.
412. C. E. Giajola.	499. J. H. Whitehead.
414. V. T. Junod.	501. J. H. Whitehead.
416. J. J. Shedlock.	525. J. Barry.
417. J. and W. Binns.	549. H. Bright.
418. J. Ryley.	571. R. Leake and J. Beckett.
423. J. Pinches.	587. J. Picklin and R. Bailey.
424. J. and H. Charlton.	697. H. Chandler.
429. G. W. Cumming and J. K. Edmonds.	765. W. Clark.
	878. R. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1901. W. Cotten.	1981. J. G. Willans.
1913. J. W. P. Field.	1982. W. Clark.
1924. E. A. Cotelle.	2061. G. T. Bousfield.
1914. B. W. Gerland.	2245. M. Gerstenhofer.
1987. R. Mushet.	1939. W. P. Hodgson and J. V. Woodifield.
1941. J. Young.	1954. R. A. Brooman.
1959. J. Thompson, and E. G. and F. A. Fitton.	1956. B. Morewood.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2018. G. Parsons.

Journal of the Society of Arts.

FRIDAY, AUGUST 17, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Proceedings of Institutions.

OLDHAM LYCEUM.—The twenty-sixth annual report says that there are many reasons for congratulation; not that any great changes have taken place during the last year, nor any large accession made to the property of the institution; but all its departments have been efficiently sustained by the Sectional Committees, and its classes effectively taught by a staff of teachers competent for their work, and deeply interested in its success; and above all, that during a year of some local excitement, perfect harmony has been maintained in a constituency including men of various religious creeds and political opinions, who have held in abeyance their diversities, and zealously co-operated for the education and literary advancement of the population around them. During the past twelve months considerable repairs have been needful in the building, and some improvements have been made in the library and class rooms. The patent specification library is now arranged, and may be consulted, at given hours, by any resident of the town, on application to the secretary. A billiard club is being established by a number of gentlemen who will present to the institution a table and its appliances. The additions to the library have not been numerous, the most important of them being the gifts of the President The average number of members during the year have been as follows:—Life members, 43; honorary, 197; annual, 236; half-yearly, 7; quarterly (male and female), 263; two months, 105; one month, 219; total 1,071. Finance:—The current income in 1864 was the largest ever realised, amounting to £581 11s. 10d. 1865 exhibits still further advance, the receipts being £618 18s. 5d.; to which must be added the sum of £30 received from the Science and Art Committee, as their proportion of working costs; making a total of £642 18s. 5d. against an expenditure of £635 12s. 9d., leaving a balance of £5. 5s. 8d. in the treasurer's hands. For this satisfactory state of things the directors owe their obligations to the persevering energy of the secretary, Mr. Bailey. The reports of the teachers in the male classes are very favourable. With reference to the female classes, in which instruction is given in reading, writing, grammar, arithmetic, sewing, knitting, &c., the report says:—"These classes afford painful evidence of the extent to which the education of females is neglected, and the difficulty of promoting it so long as its importance is not felt. The teacher says:—'The attendance is generally irregular, seldom extending over more than two quarters; the progress also is slow, as many of the pupils have to be taught the first rudiments, and, disheartened by the drudgery of mastering these, they abandon the attempt, at a time when a little perseverance would make future attainments easy; there are some marked exceptions, and amongst them those who have acquired knowledge which will go far to fit them for the discharge of the obligations and duties of life.' If the Class Committee could give any healthy impulse to this department, they would confer no small benefit upon their town." The gymnasium has been opened, and is frequented by a number of subscribers, who greatly enjoy their exercises and derive much benefit from them. The total number of volumes in the library is 7,146, and the total issues during the year have been 23,383, or an average of nearly 75 vols. daily. The books most in demand are works of fiction, and treatises upon mechanical and physical science; the latter being costly, few of them will be found upon the shelves; this deficiency, however, the president (Mr. Platt, M.P.) has generously promised to supply by presenting an ample supply of the most approved scientific works now in circulation, and making constant accessions of new ones. The treasurer's account shows that the receipts for the year ending December 31st, 1865, amounted to £643 18s. 5d., and that there was a small balance in hand. With reference to the Science and Art Schools, it appears that those for instruction in machine drawing and mechanical philosophy have been steadily increasing in interest, and in 1864 the total number of students upon the roll was 60, which in 1866 increased to 95. The chemistry class has been suspended, in consequence of the continued indisposition of the teacher. So far as instruction has been given, most of the students have shown great interest in the subject, and have attended with commendable regularity. The free-hand drawing class has not been numerously attended, as many continued in it but a short time, using it simply as a preparation for the Mechanical Drawing Class, where prizes, which by some appear to be "more coveted than proficiency, are obtained more easily than in the Art Department.". The treasurer's account for 1865 shows that the receipts were £127 3s. 7d., and that there is a small balance in hand.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(Continued from page 615).

FRUIT AND VEGETABLE CULTURE.

THREE HOURS ALLOWED.

I.—FRUIT-TREE CULTURE.

1. Give a list of 12 varieties of dessert apples to ripen in succession from August till May, and in the order in which they are ready for use.
2. The same of pears.
3. Give a list of eight varieties of kitchen apples to come into use in succession from August of one year till August of the year following.
4. Give a list of six varieties of dessert plums to ripen in succession from July till November, arranged in their order of ripening.
5. The same of cherries from May till September.
6. Name six varieties of the best peaches and state the order in which they ripen.
7. The same of nectarines.
8. The same of apricots.
9. What are the various stocks used for the propagation of the apple, and what is the effect each has on the scion?
10. What is the best form in which to train fruit trees for open fruit garden culture; and when ought the pruning of these trees to be performed so as most effectually to economise the vigour of the tree and develope the greatest amount of fruit-bearing wood?
11. What is the object for which root-pruning is practised, and at what season and in what manner is this operation to be performed?
12. Describe the process by which trees absorb moisture by their roots, and by which the sap circulates throughout their system.
13. Why are the upper shoots on a branch developed with greater vigour than the lower?

14. How is a branch increased in thickness?
15. How is a branch increased in length?
16. What are the functions of the leaves, and what is the influence that stimulates their operation?
17. Do trees absorb moisture by their roots and leaves only; and, if not, through what medium?
18. What are the substances that constitute the food of trees, and how are they conveyed and assimilated into their system?
19. What are the causes that induce canker and gum in fruit trees, and how are these causes to be removed or prevented?
20. Describe in detail, as concisely as possible, the forcing of vines for a crop to be ripe early in February, stating the period when the vines are started, the various degrees of temperature employed, and every operation practised in the course of the process.

II.—Vegetable Culture.

21. Give a list of six varieties of peas to furnish a supply in succession from May till October, and state the periods when the seed of each should be sown.
22. Describe the cultivation of broccoli, stating the soil best adapted for it, and the mode of its preparation; also the varieties to be employed in securing a succession of supply throughout the year, beginning in August.
23. Describe in detail the process of making a hotbed.
24. Prepare a list of the kinds and quantities of vegetable seeds and roots necessary for cropping a garden of half an acre throughout the year.

ANIMAL PHYSIOLOGY.

(In Relation to Health.)

THREE HOURS ALLOWED.

1. Describe the structure of the human lung, commencing at its root, and including the air tubes, air cells blood-vessels, lymphatics and nerves.
2. When, where, and how, is the gastric juice formed? Give an account of its composition and its action in the economy.
3. Enumerate the parts which serve as protective organs to the eyeball. Describe briefly their position and structure, and give the use of each.
4. Suppose a person to be suddenly immersed in carbonic acid gas, how and by what form of nervous and muscular action is suffocation produced? Name the parts which are concerned in the stoppage of the breath, and say how each acts.
5. What poison or poisons destroy human life in the case of exposure to the fumes of burning charcoal, or to the smoke of accidental fires in close rooms? What preliminary and other precautions can be taken to enable one to enter such apartments to save human life?

DOMESTIC ECONOMY.

THREE HOURS ALLOWED.

Section I.

1. Describe a convenient and economical dwelling for a working man and his family, say of four children.
2. What circumstances would influence you in the choice of a dwelling-house?
3. Give advice concerning the selection and purchase of household furniture.
4. What are the evils of the "tally" system?
5. What are the effects, moral and physical, of overcrowded dwellings in town and country? What remedies can you suggest for these evils?
6. Give an outline of the practical instruction which the mother of a well-regulated family, in which there are daughters intended for domestic service, may give to them in her own daily work.
7. What occupations of the labouring classes in our towns do you consider the least healthy, and why?
8. Explain what is meant by the words *cheap* and *dear*, in purchasing articles of food and clothing, and in other domestic arrangements for a family.
9. What are the advantages of purchasing articles of daily use, such as coal, tea, sugar, &c., for ready money rather than on credit? State what you think is the cheapest and best mode of supplying a family with these necessary articles.
10. Describe the best dinner you could provide for four children, costing only one shilling.
11. Compare the advantages of linen, cotton, and woollen clothing, with regard to durability, health, and economy.
12. Give directions for washing woollen articles, and for getting up fine linen. Give reasons for the process you recommend.
13. Write a short essay on the most common habits injurious to health and strength.
14. How may hard water be rendered soft?
15. What are the advantages and disadvantages of an open fire-place? What precautions should be observed in the use of close stoves?
16. Why are baking and frying objectionable as a means of cooking meat? Give minute directions for boiling a leg of mutton, and your reasons for such directions.
17. In what respects does coffee differ from tea as an article of diet? Which is the most nourishing and wholesome, tea, coffee, or cocoa? Why?
18. Give clear and simple directions for the management of a sick room. What are the essential qualities of a good nurse?
19. What articles of food keep up animal warmth, supply the waste of muscle, and produce bone?

Section II.

1. Describe the chemical action which goes on in the burning of a candle, and explain what takes place on blowing the fire with a pair of bellows.
2. Of what substances is flesh composed? Are they all equally valuable for purposes of nutrition? Why is beef less digestible than mutton, and the heart of an ox or sheep less so than the tongue?
3. Why is the potato valuable as an article of food, since it contains little nutritive matter? Why do we use salt with our food generally?
4. Why is bread made from wheat *meal* more nourishing and wholesome than that made from wheat flour? Compare oatmeal and wheat flour as articles of diet.
5. Hard water may safely be preserved in tanks lined with lead; soft water becomes poisonous under such circumstances. Why?
6. What are the chief articles of food in tropical, temperate, and Arctic climates respectively, and why? Can you account for the large consumption of alcohol in countries where moisture and cold accompany each other?

(To be continued.)

THE NEW CHEMICAL LABORATORIES AT BONN AND BERLIN.

One of the appendices to the Thirteenth Report of the Department of Science and Art consists of a report by Professor Hofmann, on the laboratories now being built under his superintendence at Bonn and Berlin. The report was kindly drawn up by the Professor in compliance with the request of the Department, conveyed through her Majesty's Government to that of Prussia, and is interesting—not only for the information it contains, but also as showing the high estimation in which the advancement of chemical science is held in Germany.

Looking at the increased interest taken in chemical science in the present day, and its important bearing on the industries of Great Britain, it has been thought that an abstract of this report, so far as it refers to the laboratory at Bonn, will be acceptable to the members of the Society of Arts.

Dr. Hofmann, after remarking that of the six Prussian

universities, two—and these the most important ones—the Universities of Bonn and Berlin, had hitherto remained without chemical institutions in keeping with the advancement of science and corresponding to the demands of the present day; and after referring to the difficulties that stood in the way of the realisation of this great undertaking, expresses his belief that the foundation of the two great chemical institutions now being carried out under the auspices of the Prussian Minister of Public Instruction, has a significance far beyond the more immediate impetus they are sure to give to the prosecution of chemical studies in the universities to which they belong. By the grant of means unusually large for the organisation of these new schools, a tribute of recognition has been paid to the influence of chemistry on the modern aspect of the world that cannot remain without effect upon other departments of physical science which have not been less productive of useful results.

Side by side with the two new chemical schools now springing into existence, other institutions are sure to be founded, similar in nature and appointed with the same liberality, for the prosecution of the two other great branches of natural science, physics and physiology, to which, as well as to chemistry, the future belongs.

This subject is already being freely agitated in the Prussian universities, especially those of Bonn and Berlin. The leaders in the several branches of natural sciences are persuaded, that the great efforts at the present moment being made for chemistry will, sooner or later, benefit their own departments. It is not, however, in Prussia, or in Germany alone, that the wholesome influence of this example appears to be felt. The exertions of the Prussian Ministry of Public Instruction in the cause of chemical science have attracted the attention even of foreign governments. Inquiries respecting the new institutions have already been made by several other countries, more especially by England and France, and it is not unlikely that the noble precedent set by Prussia will soon be followed by the establishment of similar schools elsewhere. It is in this sense, at all events, that the writer ventures to interpret the desire expressed by Her Majesty's Government to obtain information on the subject of the two institutions in process of organization in the Universities of Bonn and Berlin, which, at the request of the Prussian Minister, he has endeavoured to supply by drawing up the following statement. He would, indeed, consider himself fortunate if this report, which, from the nature of the case, cannot be more than an outline, should assist in augmenting the interest already felt for the establishment of a great chemical institution in the metropolis of the world, an institution which England can no longer dispense with, since no country is more deeply interested than she is in the rapid diffusion of the latest results of chemical inquiry. The reporter proposes, in the first place, to give an account of the laboratories of the University of Bonn, which were earlier conceived and earlier begun, and are, consequently, in a far more advanced stage than those of the University of Berlin.

The first negotiations respecting the building of a new laboratory in Bonn go back as far as 1861. In the summer of that year the reporter was invited by his friends, Professor Plücker and Sell, to an interview with Mr. Beseler, the Curator of the University of Bonn. But little time elapsed before the first steps for the foundation of the new chemical school were taken. The negotiations already pending between the Minister of Public Instruction and the Curator of the University were soon concluded, and in the beginning of 1862 Mr. Beseler was commissioned by the Minister to inquire of the reporter whether he would undertake the organisation and direction of a chemical laboratory to be established in the University of Bonn, on a magnificent scale, and liberally provided with all the requirements for modern investigation. The question thus opened led to a series of negotiations which ended, in the spring of 1863, in the reporter complying with this proposal.

The important duty of drawing out the plans of the new institution devolved on Mr. Augustus Dieckhoff, architect to the University, and in preparing the programme, the composition of which fell to the lot of the reporter, it appeared all-important to gather information as exact as possible respecting the chemical institutions already in existence, and the reporter was fortunate enough to obtain drawings and plans of nearly every existing laboratory. The chief experience, however, was gathered during a journey of several months through Germany, in the autumn of 1863. On this trip nearly all the German laboratories were studied, from that of Giessen, the first German university laboratory, which the father of the reporter built more than a quarter of a century ago for Liebig, down to the more recently-founded chemical schools in Karlsruhe, Munich, Zurich, Heidelberg, and Göttingen, and the splendid institution just completed in the University of Greifswald.

Ultimately a plan, the detailed contract for which amounted to 183,000 thalers (£18,450), passed, with scarcely an alteration, the several stages of supervision, and was sanctioned by Government.

The first turf was turned late in the autumn of 1864; the spring of 1865 saw the foundation stone laid; and the building, the construction of which was entrusted to an able young architect, Mr. Jacob Neumann, who had already efficiently assisted in laying out the plans, is at present being roofed in, so that in the summer of 1867 it can be handed over to the university.

The new chemical institution is provisionally intended for 60 students; the space, however, has been meted out so liberally, that accommodation could be supplied without inconvenience to a much greater number; besides this, the building has been so constructed as to allow of enlargement at any future time, by raising a second story, without detracting from the harmony of its structure.

In addition to the various apartments required for educational purposes, for practical analysis, for scientific and technical investigations, and, lastly, for the lectures, there are in the new building sets of rooms for the castellan of the institution, for the *famulus* and servants, apartments for three assistants, and also a magnificent residence for the director, consisting of a suite of rooms which, as regards number and extent, could be very seldom met with in a private house. Lastly, there is a considerable number of well-lighted basement rooms, which have as yet no special use assigned to them, but the construction of which could not be avoided.

The various departments of the building are spread over three floors, the basement, the ground floor, and the first floor. The first floor, however, extends over but a small portion of the structure, and is exclusively occupied by the private apartments of the director. But few of the rooms devoted to the purposes of the institution are found in the basement, as, for instance, the store-rooms, the rooms for metallurgical and other operations requiring large quantities of fuel, those for medico-legal and chemico-physiological research, &c. All the remaining space intended for educational purposes, viz., the laboratories, with their adjoining rooms for special operations, and side-rooms, balance-rooms, rooms for volumetric analysis, combustion-rooms, lecture-theatres, the hall for collections, the study and private laboratory of the director, the apartments of the assistants and other officers of the institution, are, one and all, on the ground floor, an advantage which would not have been obtained had the site of the building been of more limited dimensions.

As the ground floor had to contain no less that 44 rooms, exclusive of vestibule, corridors, and closets, its dimensions necessarily became very considerable. Four outer wings enclose an area of very considerable size, divided into four quadrangles or courts by a cruciform interior building. Those parts of the edifice surrounding the two back courts are exclusively devoted to the pur-

poses of practical instruction in chemical analysis and research. The wing of the central structure which separates the two front courts from each other includes the lecture theatre, with the rooms pertaining thereto; in the south-west side wing of the left front court is the private laboratory of the director, with the rest of the rooms devoted to his use. The corresponding north-east side wing of the right front court is occupied by the apartments of the assistants and other officers. The ground floor of the front part of the building, lastly, is devoted to the scientific collections of the institution and a small theatre for special lectures.

The main entrance for students, as well for those working in the laboratory as for those who only attend the lectures, lies in the principal side-front facing the city of Bonn.

After ascending the stairs we enter a large vestibule richly decorated. Before the spectator stretches a long corridor of considerable width, the main artery of the entire building, brilliantly lighted by a number of windows on the left side. The large folding doors at the further end of the corridor, visible from and directly opposite to the main entrance, lead to the director's spacious study, which is provided with a large bow-window for microscopic observations; from this central situation the various parts of the great building are quickly and easily accessible. On the right-side the great corridor branches out into three side-corridors leading to the entrances of the three principal laboratories, each lighted by ten windows, symmetrically arranged on the two sides, and providing 20 students with more than sufficient space and every convenience for work.

Permanent working-places for 60 students, which, as already mentioned, the institution is to accommodate, were thus secured. According to this disposal of the space, the students range themselves in three classes:—1. Beginners, that is to say, those who having become acquainted with the rudiments of chemistry by attending lectures, enter the laboratory to become exercised in chemical manipulation, to make preparations, and to go through an elementary course of qualitative analysis. 2. Advanced students, or those who, having acquired practice in qualitative experiments, are occupied with quantitative analysis, both ponderal and volumetric. 3. Young chemists, sufficiently conversant with the principal department of chemistry to engage in the original experimental investigations, either suggested by the director or chosen by themselves.

A division of this nature, whereby the three classes are distributed in separate rooms, seemed expedient for more that one reason. Not only was it possible to fit up each laboratory in a manner suitable to the wants of each particular class, but the situation of the rooms themselves could be so adapted to the remaining parts of the building as to offer the greatest facilities to each division. And higher still must be rated the advantages as regards readier supervision and increased means of maintaining discipline in all parts of the institution afforded by an arrangement of this kind.

The good arising from a large number of students working together in an extensive institution is unmistakable. If the student have but his eyes open to the work of his neighbours he has opportunities of gaining, in a comparatively short time, an amount of experience which, working alone or in company with only a few, he could scarcely gather during years of diligent labour. It is the chemical atmosphere in which he works that promotes his progress.

These advantages, on the other hand, cease when the number of learners exceeds those limits within which personal supervision is still possible. As soon as the beginner is no longer conscious that he is able to procure help at any moment—as soon as the more advanced student no longer feels that he receives individual attention—lastly, as soon as the young chemist, though working independently, is no longer satisfied that an experienced eye watches over his steps—the chemical institution, however excellently it may be organised in other respects, will yield very small results indeed. It is, therefore, of the first importance for the director of such an institution to have the necessary teaching power by his side. According to the reporter's experience it is not possible for an assistant to superintend, for any length of time and with satisfactory results, the labours of more than twenty students. Acting upon this experience, the Minister of Public Instruction decided to appoint for the institution of Bonn three scientific assistants, who, under the guidance of the director, are to watch over the experimental studies of the students. The disposal of the students in three separate laboratories seemed to accord particularly well with this provision.

In these three laboratories the students have their permanent working places. To each one is allotted, for this purpose, a table amply supplied with gas and water, as well as lock-up drawers and cupboards in which to keep apparatus, re-agents, &c. At these working benches all ordinary chemical work and all operations, not requiring the special arrangements provided in other parts of the institution, are carried on.

Turning now our attention to the side apartments attached to the three laboratories, we have, in the first place, to mention three closets in direct communication with the main rooms. They are in charge of the respective assistants, and are intended for preserving delicate and costly apparatus, platinum and silver vessels, expensive re-agents—everything, in fact, of which special care has to be taken.

There are certain operations which cannot be well conducted in the three laboratories referred to. On this account they are connected with a series of rooms devoted to special purposes. There are three rooms, directly communicating with the laboratories, called "operation rooms;" and here all kinds of work, such as distillations, making of gases, heating of bodies in particular gas atmospheres—in short, all experiments requiring large and complicated apparatus, are conducted at the benches fitted up in these rooms or in the "evaporation niches" let into the walls. In case, however, on any particular occasion, even more space should be required, each operation room communicates with a covered colonnade, opening towards a back court, and fitted up with gas and water and all the requisites for work. From these colonnades the basement of the building, containing a variety of rooms devoted to the objects of the institution, and more especially the metallurgical laboratories, is accessible by means of spiral staircases placed in spacious semi-circular projections from the outer walls. Flights of steps on the other hand, lead from the open sides of the colonnades down to two back courts lying between the three laboratories, and here the student finds an additional supply of water in large central reservoirs, the tabular parapets of which serve as working benches for a variety of operations.

The three operation rooms, situated behind their respective laboratories, are not of equal dimensions. In apportioning their size especial attention had to be paid to the wants of the beginner and of the independent worker. The beginner who practises the various forms of chemical manipulation, preparing gases, making chemical preparations of all kinds, &c., requires ample space in which to develop his activity. In like manner the young chemist engaged in actual research may at any moment want to fit up new or reconstruct old apparatus, often of a complicated nature, for the particular objects of his investigation; tools of the most various description, hammers, files, vices, &c., are thus constantly required, not to mention the blowpipe-table scarcely ever at rest. For him too it is of vital importance that he should not be cramped in space. For this reason the operation rooms connected with the two wing laboratories, and expressly intended for the classes just mentioned, are made as large as possible. The students

of the second laboratory, principally occupied with quantitative analysis, have therefore had a less spacious operation room allotted to them. By this arrangement an additional small apartment was gained, symmetrical with this operation room, and serving as an approach to a very important part of the institution, viz., the laboratory for gas analysis. This spacious apartment projects from the middle of the building at the back, and is thus almost equally accessible from the three laboratories; it is on the other hand sufficiently removed, more especially by the intervening ante-room, from those parts of the building where the chemical business of the institution is most active, to allow of the delicate measurements here made being carried out without disturbance. It is lighted by two large side windows and also by three smaller windows situated in a central projection; but all the light coming from the south can be shut out by means of strong well closing shutters, thus securing to this apartment the uniform temperature so important in gas analysis.

Along the main corridor lies a series of rooms opening upon it, and lighted by windows looking into the back courts of the institution. Close to the vestibule, immediately to the right and lying between the entrance to the first and second laboratories, is, first of all, the volumetrical analysis room, where are kept the standard solutions, daily increasing in variety, as well as the graduated vessels.

The balance room, the next in order, is not only intended for the reception of chemical balances, but also of the more delicate physical instruments made use of in analysis, such as air-pumps, barometers, &c.

Next follows a room for fusions and ignitions, capable of being carried out by means of gas. Here are the necessary appliances for the various heating operations occurring in mineral analysis. This room is also fitted up with all the requirements for organic analysis (carbon and nitrogen determination), likewise exclusively conducted by means of gas, and carried on in special "combustion niches" let into the walls, and communicating directly with the outer air by means of wide tubes of glazed earthenware. This room also contains the ranges of water ovens required for drying the substances to be submitted to analysis. In these ovens, which are heated by the steam of the stills for distilled water in the basement, every student has his own compartment under lock and key. With respect to the uses of these three rooms, they are more especially intended for the workers in the middle laboratory; they are, however, accessible also to the beginners. The balance-room is purposely situated in the middle, and separated from the laboratories by the volumetric analysis room on the one side, and the room for fusions and ignitions on the other, so as to protect as effectually as possible the costly instruments of this room from the fumes which, in spite of all ventilation, at times escape in a laboratory. The situation of the balance-room, between the two others, affords an additional and a by no means trifling advantage; numerous operations preceding the weighings, such as drying substances in the water bath, heating crucibles, collecting the combustion products in organic analysis, &c., all take place in the immediate neighbourhood of the balance, whilst on the other hand the preliminary weighings, invariably forming the first step in volumetric analysis, can be made in close proximity to the room devoted to the subsequent stages of volumetric observation. The three rooms therefore communicate directly with each other.

Between the second and third laboratories are, in addition to a small flight of steps leading to a number of attics over the ground floor, three precisely similar rooms, accessible from the corridor, and with doors opening into each other. Of these, the one nearest the second laboratory is intended for the library.

The main results of chemical investigation are duly registered in treatises and manuals, and are therefore easily within the reach of students. But the statements to be found in books of this description cannot be more than abstracts, always very considerably condensed, and often more or less garbled, from the memoirs of the first observers. As soon, therefore, as the student has got beyond the first rudiments he can no longer dispense with original sources of information. The main bulk of chemical observation is collected in a series of periodicals and journals, the volumes of which are counted by hundreds, and if all were collected certainly by thousands. Again, many important investigations have been communicated by their authors to the various academies and learned corporations, and are printed in the transactions of these societies. Thus it happens that the literature of chemistry, though the youngest of sciences, has already attained to very considerable dimensions; and to collect the works which have to be consulted in the prosecution of even limited investigations in most cases far exceeds the power of any single individual. These books could of course be readily procured from any public library, but reference to original communications is but too frequently omitted if the work is only to be had by specially sending for it. On this account every chemical school possesses a library, more or less complete, offering to the student a copious collection of original memoirs, which he can consult at the very moment he may require their assistance. The use, it may be said the necessity, of such libraries is so apparent that students themselves have in a great many instances most materially participated in their foundation and subsequent development. In this way, from but small beginnings, some most complete collections of chemical works have been formed. The reporter, when a young student, had the good fortune to take part in the establishment of such a laboratory collection, under the auspices of his illustrious master, Baron Liebig, at Giessen; this is now the oldest and probably the largest chemical library extant. In later times he had the pleasure of assisting in the inauguration of a similar collection for the Royal College of Chemistry in London. Such a library it is of course in contemplation to establish for the Bonn laboratory, and already, long before its opening, a number of books have come in as presents. The situation of the room set apart for their reception, between the second and third laboratories, is peculiarly appropriate, because it is more especially to the students of these two laboratories that the library will be of use, whilst its slight distance from that part of the institution where the director carries on his own researches is likewise a great convenience to him and his assistants.

The two remaining rooms lying between the second and third laboratories are a balance room and a room for fusions and ignitions. With these rooms, on the right-hand side of the principal corridor, terminate the ground-floor apartments intended for practical instruction. We have now only to glance at the theatre and adjoining rooms for preparing the lectures and preserving apparatus, models, drawings, and collections of all kinds.

The students attending chemical lectures in the German universities are always much more numerous than those who work in the laboratories, and, therefore, more accommodation had to be provided in the lecture hall.* A lecture room capable of holding 250 students appeared to meet the requirements of the University of Bonn. An area of 40 feet square was found sufficient for this purpose, and at the same time to afford ample space for the lecture table, as well as for the free movement of the lecturer and his assistants.

In the great lecture hall, the seats are arranged like the tiers of an amphitheatre, and in the lower part, just opposite the entrance, is placed the lecture table, 40 feet long and 3 feet 4 inches wide. In the lower part of the wall, behind the table, are the evaporation and ventilation niches for experiments,

* During the winter session of 1865-66 the University of Bonn was attended by 818 matriculated and 35 non-matriculated students: total number of students, 853.

whilst on its upper part drawings and diagrams can be exhibited. The lecture room is lighted from both sides, so that neither professor nor audience is obliged to face the light, an advantage sure to be appreciated by any one who has been either lecturer or hearer in a room of different construction. The fourteen windows which supply light on either side are arranged at a height of nine feet above the floor of the hall, except the two next the lecturer, which descend to the level of the table, enabling him to exhibit many colour-phenomena by means of transmitted light, and to employ sun-light, under favourable conditions, as an agent in his experimental illustrations.

The theatre communicates with the laboratory of the lecture assistant by means of two side doors, and a large niche in the centre of the wall. Here everything required for the lecturer is got in readiness, and for this purpose all the necessary furnaces and benches are provided. In this room larger pieces of apparatus can be fitted up upon a table moving on rails, which can be run through the niche already mentioned in the theatre during the course of the lecture. This laboratory is lighted from two sides, on the north-east by a large window, and on the south-west by a glass door communicating with a platform; whence a staircase leads down to the front court. These steps also communicate with the rooms of the basement underneath, for the storage of compounds requiring a low temperature, sealed tubes containing condensed gases, &c., and likewise give access to a well-ventilated closet immediately under the lecture-table, containing a large galvanic battery, the wires of which pass through the ceiling into the theatre above. The room where the experiments for the lectures are prepared is of course in close connexion with the store-room for apparatus, models, drawings, and diagrams; this room likewise is lighted from both sides. Further on we come to the last room of this series, having but one window, which is used for the preservation of the various documents belonging to the lectures, such as printed forms, registered lists of students attending, &c., and where the professor may stay before entering the theatre, and receive those students after the lecture who wish to consult him. This room, called the lecturers' waiting-room, communicates with the mineralogical museum, one of the great halls assigned to the scientific collections of the institution. This hall, as well as the one next to it, which being profusely lighted by six windows symmetrically disposed on both sides, is intended for the chemical museum, is in the front block of the building. Close to the mineralogical museum is a small lecture room for recapitulations and special lectures to be conducted by the assistants.

All the rooms for apparatus, chemical preparations, &c., used in the lectures are situated between the two rooms devoted to oral demonstrations, so that all requisites for the lectures can by conveyed with the greatest ease either to the larger or the smaller theatre, and back to the collections. It was not without intention that the museums were somewhat removed from the busier departments of the institution. The experience of the reporter, which is not unlikely to receive confirmation from others, has taught him that the love of research and zeal for discovery in young chemists, however praiseworthy in itself, is at times anything but conducive to the increase of scientific collections.

The large halls for the mineralogical and chemical collections, together with the smaller theatre and its preparation room, occupy almost the entire ground floor of the front block of the building. In addition to these are still to be mentioned two vestibules, leading the one to the main staircase, the other to the back staircase ascending to the apartments on the first floor; then immediately to the left of the north-east entrance a lodge for the house porter; and, lastly, close to the south-west entrance, apartments for one of the junior assistants of the Institution.

Of the two sideways, the one stretching out at right angles from the left of the main vestibule in the north-east front contains the porter's lodge and other apartments, while the other side wing is entirely devoted to the scientific purposes of the director, with whose study this part of the building is in immediate communication. Of the rooms situated in this wing mention must first be made of the private laboratory of the director, which is lighted by four windows. On one side of this lies the director's waiting room, accessible from the main corridor, and communicating with his study by a short private passage. Beyond the other end of the private laboratory are two small apartments, one to be used as a balance-room, the other as a room for ignition, fusions, and combustions. The latter has egress to a little portico for experiments required to be performed in the open air.

The basement is, to all intents and purposes, a repetition of the ground-floor, the greater thickness of the walls, however, lessening the amount of space to some extent. The rooms in this part of the building are 12 feet in height from the floor to the top of the arch, and are sufficiently lighted throughout, by numerous windows of comparatively large dimensions.

Along the main corridor of the basement are two spacious rooms, of which the first is intended for the storage of solid, the other for that of liquid re-agents. Both store-rooms are close to the flight of stairs leading on one side into the courts, on the other to the ground-floor, whereby the carriage of chemicals to the store-rooms, and thence to the main body of the institution is greatly facilitated. The same accessibility to the floor above pertains to the other two rooms along this corridor, and has determined their especial uses. In the one nearest to the staircase a steam boiler will be set up; while directly communicating with the steam boiler room, and at the same time accessible from the corridor, is a large and well lighted apartment intended for rougher kinds of work, and especially for a general wash-room, where apparatus of all kinds can be readily cleaned. For all these purposes the close proximity of the steam boiler is an especial advantage. In this room, moreover, a large press will be fitted up, in the use of which for hot pressing purposes the steam, close at hand, may likewise be turned to account. At the extreme end of the corridor is a fine well-lighted room, corresponding in form and size with the director's study on the floor above; this is a store-room for the large stock of glass and porcelain, under the charge of the castellan.

The two rooms next in succession are provided for chemico-physiological researches; the large well-lighted room at the end being the laboratory for physiological chemistry, whilst the adjoining room is fitted up as a stable for the housing and feeding of animals required for the investigations.

In addition to this laboratory, the basement of the back block of the building contains two furnace rooms for smelting operations, carried on by means of coal and coke. The larger of these, that situated in the middle, is for students of the second and third laboratories; while the smaller one is for the beginners. These laboratories are purposely located in the basement, the greater height of the chimneys of this flat ensuring a considerable increase of draught. They are, moreover, far less frequently used than the rooms on the ground floor. Lastly, the dust and dirt invariably attending the use of coal is thus almost entirely excluded from the flat above. The furnaces and appliances set up in these laboratories are of a varied nature; among them specially protected niches for operations carried on under great pressure, such as digestion of substances in sealed tubes, &c., deserve particular attention.

For the storage of the fuel required for the furnace-rooms, four coal cellars have been provided.

With regard to the courts themselves, it deserves to be mentioned that the two front courts communicate by means of a thoroughfare cutting the front wing of the cross building immediately under the landing of the

theatre staircase; in this manner any one of the four courts can be reached through the carriage-way facing the town, without entering the interior of the building. Such a disposition is of great use for the preservation of cleanliness throughout, and of absolute necessity in order to render all parts of the building accessible in case of fire.

Attention must still be directed to some of the rooms situated on the basement of the front part of the middle wing.

On descending from the ground floor to the basement, we pass through the vestibule into a large workshop lighted by three windows. Here the rougher work required for the lectures is performed; here liquid carbonic acid would be prepared, and here, in a well-ventilated niche, stands the large galvanic battery already mentioned, the wires of which, passing through the floor of the theatre above, communicate with the electric lamp, now rapidly becoming an indispensable appliance of the lecture-table.' Further on is a small laboratory for medico-legal investigations; it is lighted from both sides, and being accessible only to the director and the lecture-assistant, is effectually protected from all undesirable intrusion. Beside the room for the rougher lecture work there is a small cellar communicating with the vestibule, in which compounds requiring a low temperature, explosive bodies, such as gases condensed in hermetically-sealed tubes, like sulphurous acid, chlorine, &c., are preserved. Substances readily undergoing decomposition, generating corrosive vapours, or in any way dangerous, can thus be conveniently excluded from the general collection.

The external aspect of the new laboratories is in perfect keeping with the scale of grandeur of the ground plan. The street front is 180 feet in length; the side-front, with the main entrance for students, has a depth of 250 feet.

Only the front block of the building has a second story; this contains a most splendid suite of apartments provided for the director of the institution. This residence is richly ornamented, and will in all respects be worthy of the institution to which it belongs. The reporter "must not enter into details upon this subject, but he cannot leave unnoticed the imposing entrance hall, illuminated by a glass cupola above, and the splendid ball-room, extending through two stories, amply satisfying the social requirements of a chemical professor of the second half of the nineteenth century."

PARIS EXHIBITION OF 1867.—HEATING AND LIGHTING.

The following communication has been sent by Mr. E. Chadwick, C.B., to the Committee which has been appointed to consider this subject:—

Sir,—In the course of my service I have had to take part in the preparation of measures for the prevention of the smoke nuisance chiefly in respect to the large furnaces of manufactures. The subjects, however, involved also the important question of economy of fuel, which has in many instances been considerable. It is unnecessary to enlarge upon the importance of that topic to all countries. Very considerable economies have been achieved in respect to large furnaces by compulsory measures, but it would be an important result of the proposed International Commission to ascertain, upon well-considered trials, and make known authentically, for voluntary adoption, the best means of economising fuel. Our Army Sanitary Commission, about seven years ago, directed competitive examinations to be made of the heating powers of boilers, as also of different forms of cooking-ranges. As to boilers, the result of these competitions was a gain of full one-half, namely, that 1lb. of coal in one form effected as much as 2lb. in another; and in respect to cooking-ranges, the difference of result reported was as much as from 64oz. to 2¾ oz. of coal per head of men cooked for.

Probably by this time these means might advantageously be re-examined, even for England. But these trials related to the larger army cooking-apparatus. What I beg you to submit to the consideration of the Commissioners is, that instead of an exhibition of mere iron or metallic forms, put forth sometimes with common and little-headed traders' pretensions, which have not been tested with any degree of accuracy even by themselves, the Exhibition spaces allotted should be competed for by authentic and well-considered trials, and that these trials should be carefully extended to three classes at least of domestic appliances; 1st, those for the cottage, to cook and at the same time warm the dwelling-rooms and heat irons; 2nd, the grates for warming dwelling-rooms of larger houses; 3rd, the larger cooking-ranges of every kind for hotels and mansions, to roast, bake, boil, stew. I need not go into the details of these trials—they would be for subsequent consideration. The heating powers of grates might be tested in given spaces and trials with different sorts of coal. Perhaps the convenience of inventors or manufacturers would be tested, and the trials themselves advanced by having arrangements made for conducting them in England and in France at the same time. Probably the foremost means might be retested upon some agreed plan in Paris. As far as my own information goes, the greatest and most successful achievements in cooking power have been made in France to an extent of two, even three, to one as against the kitchen cooking appliances in England. It would be of use to the French manufacturers, perhaps, that their success should be tried in England. What would be required would be provision of rooms and scientific attendance. Some manufacturers might be willing to pay for the expenses of the trials, but I should submit that this is a very inferior matter for consideration. Each might be allowed to attend by themselves or others to witness the conduct of the trials.

Speaking of England alone, there can be no doubt that in the domestic ranges a saving of one-half the fuel is attainable by improved construction.

I ascertained that the washing-bill for London could not be less than five millions per annum, and that one-half of this, probably, would be saved by economising smoke.

I asked my friend Mr. Twining to submit the suggestion of competitive trials on this subject to M. le Commissaire-Générale of the Exhibition, and through Mr. Twining I have received a letter in which M. Le Play states:—

"J'ai examiné avec un vif intérêt ces observations, et je m'empresse de vous indiquer la voie qui me paraîtrait la plus sûre pour réaliser la pensée de M. Chadwick. Il conviendrait qu'il voulût bien se concerter le plus prochainement possible avec quelques représentants eminents de la science en Angleterre, en France, et en d'autres pays. Une fois le concours de ces notabilitiés assuré, un programme soumis à leur adhésion et déterminait, le plan des travaux devrait m'être aussitôt adressé. Je m'empresserais de le soumettre à la Commission Impériale, et je me plais à espérer qu'elle jugerait possible de choisir les personnes adhérentes au projets de Monsieur Chadwick en qualité de membres d'une section spéciale de la Commission Scientifique, instituée aux termes de l'arrêté du vingt Septembre dont j'ai l'honneur de vous adresser ci-inclus un exemplaire, pour concourir à la vulgarisation des inventions utiles."

I am, &c., Edwin Chadwick.

To Henry Cole, Esq., C.B.

NATIONAL MUSICAL EDUCATION.

The following article, having especial reference to the proceedings of the Musical Education Committee, is from the *Morning Star* of Friday, the 10th inst:—

However little we may be disposed to agree in matters

political with Mr. Matthew Arnold's glorification of continental "geist," we are compelled to coincide in his condemnation of the wretched condition of the fine arts in this country, as compared with France, Italy, or Germany. In æsthetic education individualism does not indeed seem qualified for success. We do not believe that in artistic capacity Englishmen are one whit inferior to Frenchmen or Germans; the reason, therefore, that the former make so poor a show beside the latter in many artistic pursuits we can only look for in the entire absence in this country of any public organisation for training the high natural powers which now run wild and waste. In France, in Germany, in Italy, the State undertakes systematically the artistic education of a limited number of the most gifted youth of both sexes. Hence there is never a deficiency of skilled teachers of music and the plastic arts in those countries; whereas in England, though we have some great artists, they are accidents, and we cannot in the present state of things, without an intelligent teaching body, expect any general diffusion of the principles of sound art throughout the country. This want is felt more especially in music, for our cathedrals and churches of all denominations require a constant supply of trained musicians, while the growing taste for music among all classes, ill-regulated as it unhappily has hitherto been, attracts an increasing number of teachers. The absence of some central body to guide the public taste in musical matters, and to train professors of the art, is becoming more and more a subject of complaint. The Society of Arts has recently taken the matter in hand. A committee was appointed for the purpose of inquiring into the present condition of musical education in England, and comparing it with the continental system. The Prince of Wales was chairman, and several gentlemen, well-known for their interest in questions of art, took a part in the investigation. The committee's report has just been published, and is a very interesting and instructive document. It contains very copious details respecting the constitution and working of the various institutions for musical training, for the most part originated and supported by private persons, at present existing in this country. These are the Royal Academy of Music, the National Colleges of Music, the London Academy of Music, the London Vocal Academy, and the Military School of Music. Reports are subjoined of the state and success of the musical institutions of Paris, Munich, Vienna, Prague, Leipsic, Berlin, Milan, Naples, Brussels, and Liège. The evidence of the chief professors, composers, and performers, as well as of some critics and gentlemen who have studied the question, is given at length; so that it will be seen ample materials have been provided to enable the public to form a judgment as to the expediency of the State interfering in the matter.

The report itself is very brief, and merely gives an outline of the plan which the committee would desire to see adopted. The Royal Academy of Music, which is organised under Royal charter, and receives £500 per annum from the State, would be the natural centre of a new system. The committee would look for a considerable Parliamentary grant, under the control of the executive, as the first requisite for organising afresh the musical education of the country. In this way gratuitous instruction, on the French plan, might be given to persons of great natural powers, who would engage to devote themselves to the public service as musical teachers, and who, after their education had been completed, would for some time receive support by means of scholarships given away by competitive examination. The institution would also be open, on payment of moderate fees, to the general public. The present premises of the Royal Academy of Music being unfit for their purpose, the Committee propose that a site should be obtained from the Crown, and buildings be erected by funds raised by subscription. It is believed, of course, that were these suggestions adopted, the lovers of music in England would come forward most liberally to assist in providing a proper asylum for the new Academy. The present state of music in England is enough to show how urgent some step in advance is needed. If we glance over the names of the celebrated composers, singers, and performers of the day, we see many French, German, and Italian names for every English name; and this but faintly represents the immense defect of trained teachers and performers which is to be found in the lower ranks of the musical profession. We cannot go into the details of the foreign institutions which are given in the report, but one or two instances will be enough to show that to account for the inferiority of England in musical skill we need not assume that she is inferior in musical taste or power. Our entire State contribution to musical teaching is, be it remembered, £500 a-year. In France the Government maintains the Conservatoire at Paris at a cost of nearly £8,000 per annum, besides giving subventions to various provincial places of instruction. Throughout Germany the musical academies, which are all well endowed, receive likewise State assistance to a large extent. In Italy the three academies of Naples, Milan, and Florence receive in various proportions an annual grant from the State of more than £11,000.

The report is well worthy of public attention. It may be asked, what good result could the community in general expect from an increased expenditure, legislative or voluntary, in this direction? We cannot look, to be sure, for any material or immediate advantages; but surely there can be few who will refuse to acknowledge that as you raise the taste of a nation, you withdraw them from debasing vices, and elevate them in the moral scale. England, moreover, has of late been so absorbed in the struggle for commercial and manufacturing supremacy that she has neglected and lost her old fame as a land of music. Perhaps we can hardly go so far as to indorse the somewhat imaginative declaration of Mr Chester that "Merry England was musical England;" but we share with him the hope that the efforts of the Society of Arts may help us to make England musical again. We are not in general votaries of State subvention or State action where private and voluntary organisation can possibly be made available. But we seem to be exactly in the same position with regard to music that we are with regard to literature. The State gives just enough to affirm the principle of State patronage; not enough to be of the slightest practical service. By giving nothing we should, at all events, save a trifle; by giving something substantial we should, at least, accomplish a result; at present we sanction the vice of the worst kind of patronage without achieving any of the good purposes which a wise and practical patronage generally secures.

CONSERVATOIRE OF MUSIC.—PARIS.

The annual competitions finished on the 28th of July, with the classes of wind instruments, in which the competitors are always numerous, and whatever may be the general opinion respecting the instruction of the Conservatoire in other branches of music, it is unanimously admitted that as regards wind instruments it produces a large number of excellent performers. During this portion of the competitive examinations there is no fashionable public in the theatre, which is half filled with military musicians, for whom this portion of the competition has a special interest. The juries for these divisions consisted of MM. Kastner, Bazin, Benoist, Collin, Dauverné, Jonas, Meifred, Renaud de Vilbac, and Cokken, all eminent composers, professors, or instrumentalists, with M. Auber as President.

Flute.—Eight competitors, all pupils of M. Dorus, professor in the Conservatoire. The *morceaux* selected for the competition were fragments of the fourth concerto of Tulon. The prizes awarded were one of the first class, one of the second, divided between two competitors; and first, second, and third accessits.

Hautbois.—Seven competitors, pupils of M. Triebert,

Selection from the concerto of Vogt. The first prize was awarded to M. Delaby, a blind pupil; the second was divided between two competitors. A first accessit was also awarded between two pupils, one being blind.

Clarionet.—Seven candidates, pupils of M. Klosé. Piece, the eleventh solo of Klosé. There were awarded a first and second prize and a first accessit.

Bassoon.—There were only four competitors in this class, of which M. Cokken is the professor, but they exhibited unusual proficiency, and called forth enthusiastic applause. The piece selected was the first *morceau* of the concerto of Weber. Awards: a first and second prize, and a first and third accessit.

Horn.—The playing in this class was also remarkably good. Four competitors, pupils of M. Morh, a solo by the professor being selected for the competition.

Trumpet.—Eight competitors, pupils of M. Dauverné. Piece selected, the third solo of the professor. Awards: first prize, and second prize divided.

Trombone.—Three competitors, pupils of M. Dieppo. Piece, a solo by M. Bazin. Awards: first and second prizes, and first accessit.

The results of the competitions in the classes of military pupils attached to the Conservatoire was as follows:—

Trombone a Piston.—Four competitors. Awards: A second prize and three accessits.

Cornet a Piston.—Six competitors, pupils of M. Forestier, whose sixth solo was selected for performance. Awarded: first and second prizes, and three accessits.

The Saxophone and Saxhorn are favourite instruments in Paris, and the competition in each case was brilliant. In the former class there were granted one first and three second prizes; and three first, three second, and four third class accessits. M. Sax is professor of this class. The number of competitors in this case is not given.

Saxhorn.—Five competitors, who performed a fantasia from "La Muette," by M. Arban, the professor. Awards: one first and three second prizes, and a first accessit, all the candidates being rewarded.

The particulars of the competition in the violin and violoncello classes are not given.

The total number of awards made this year was 263, namely, 33 first prizes, 2 second, first, and 46 second prizes; 30 first class medals, 39 first accessits, 36 second class medals, 33 second accessits, 24 third class medals, and 30 third accessits. Three of the successful competitors were pupils of the Imperial Institution for the Blind.

The concours of the Conservatoire leave no doubt about the quantity of musical talent fostered and ripened in its classes; but the general opinion respecting the quality of the instruction and the results obtained is not so satisfactory. It is admitted almost on all hands that the results, as far as regards the mechanism of the art, are nearly always good; but it is almost as generally maintained that there is very much yet to be done, or undone, with regard to the higher branches of the art. The acquirements of the Conservatoire pupils in general are declared to stand in the inverse ratio of the perfection of the instrument employed. The performances on the horn, trombone, trumpet, and other instruments of like importance are universally applauded, while those of the violin and singing classes are as universally cited as sadly wanting in the higher elements of the art, and public opinion seems to accept the critical complaint as, at any rate, not quite without foundation. Many persons declare that the Conservatoire requires entirely remodelling; not that the professors are unskilful, but that the system has fallen into the groove of routine, that the pupils are primed to the performance of certain *morceaux*, according to accepted methods and traditions, but not trained to think for themselves or led to the study of the principles of their art. It is the universal complaint against almost all popular establishments, and unfortunately to a certain extent as irremediable as it is well founded. It is the fault inherent in all attempts to force talent wholesale and at small cost; it is the bane of many of the best-intentioned efforts towards artistic education on the continent; the grand error of supposing that any system of mere teaching can supply the place of true training, fitting to the individual character and abilities of each pupil.

There are always more than six hundred pupils in the Conservatoire, and the supporters of the system say that out of such a number there are of course only a very few who possess genius; but to this it may be replied that the great majority of the pupils are not only wasting their own time but that of the minority also, for the professor is bound to divide his attention amongst all his pupils, even though, if he be a man of any perceptive power, he must be aware that out of every ten in his class perhaps seven are totally unfitted to make musicians. This argument holds good against all institutions the aim of which is to force ability and manufacture genius; and the principle upon which it is founded is, that it is manifestly unjust both towards youths of ability and the public at large, to foster the unfounded aspirations of mediocrity by gratuitous, or even cheap, teaching where the promise of success is not tolerably certain. But there is another complaint which applies specially to the Conservatoire—the pupils are said to be deplorably ignorant. Formerly there was a rule that they "should have a certain knowledge of the principles of the French language," but it does not appear that any attention is paid to the general education of the pupils, who are said "to consist principally of the children of artizans, concierges, and small tradesmen, deeply imbued with a belief of their high calling, but supremely disdainful of the exigencies of grammar." This accusation may be somewhat overcharged, but there is little doubt that it is true in the main; nor is there any question that, while youths without mental cultivation may make excellent performers on the horn or trombone, the chance of their becoming true artistic musicians must be small indeed.

Religious Music.—The annual distribution of prizes at the school of religious music founded by M. Louis Niedermeyer also took place recently, under the presidency of M. Hamille, who represented the Minister of Justice and Religion. The distribution was preceded by a concert, performed by the pupils of the school, who gave two choruses of the fifteenth century and the Kyrie of the mass by the founder and director of the school. The prize pupils of the piano class performed Hummel's grand sonato, and that of Weber in C. The list of prizes and accessits awarded is a long one:—Three in musical composition, two in fugue, three in harmony, eleven in the organ class, five in chanting, fourteen in the piano class, and six in solfeggio. In this school the general education of the pupils is made a matter of special care; thus, there were bestowed one prize for religious instruction, five awards in the class of literary studies, and one prize for Latin. The jury consisted of MM. Félicien David, Foulon, Ermel, Saint-Saëns, Barbereau, Gewaërt, d'Ortigues, Maleden, Pacini, with the director and professors of the school. This establishment is not public or gratuitous in the general sense, but most, if not the whole, of the pupils are scholars presented by the archbishops and bishops, patrons of the school. There is another feature deserving of notice, namely, that the young men do not necessarily quit the establishment when they have obtained a prize, but remain to consolidate the knowledge and skill they have obtained in the classes; thus, the first prizeman of last year, although not competing, took part in the exhibition and received high complimentary mention.

Manufactures.

Petroleum Stores.—A correspondent asks whether it would not be desirable, bearing in mind how largely property has been destroyed by fires which have origin-

ated at petroleum stores, owing to the ignited petroleum flowing down drains and waterways, thus carrying destruction with it to remote districts, that the Government should interfere and and prevent the storage of large quantities in buildings which have connection with the drains, or are situated over the brinks of rivers or canals, and thus confine the risk, as much as possible, to the immediate spot on which the petroleum is stored?

New Musical Instrument.—The *Musical Standard* says:—"We hear from Paris of a new musical instrument of striking power and sweetness, and at the same time extremely simple construction. It resembles a piano with upright strings, except that the strings are replaced by tuning-forks, which, to strengthen the sound, are arranged between two small tubes, one above and the other below them. The tuning-forks are sounded by hammers, and are brought to silence at the proper time by means of dampers. The sounds thus produced, which somewhat resemble those of the harmonium, are said to be extremely pure and penetrating. They are very persistent, yet instantly arrested by the use of the dampers."

Paper Pulp from the Esparto grass is now largely shipped from Carthagena to Belgium and England. The export of esparto from Spain has increased five-fold of late years, and, with lead for ballast, British shipping have the advantage of making a profitable return freight. The import of esparto in 1865 into Great Britain was 51,522 tons, against 43,403 tons in the previous year; and the price to the papermakers is now greatly reduced. This year the imports have been still larger.

Turkish Silk Manufactures.—A silk-reeling factory has lately been established at Damascus, by a French merchant, which works well and is remunerative. Of looms for the manufacture of native silk stuffs, there were 3,436 in the year 1859, 700 in the year 1860, and only 550 in the year 1861; thus one of the effects of the sad events of 1860 was the destruction of nearly 3,000 looms, all of which belonged to Christians; but now these are being gradually re-established, and in 1864 there were 3,156 looms at work; more than 2,000 of them, however, are the property of Mohammedans. The following shows the number of pieces of silk stuffs produced at these looms:—In 1859, about 50,000 kerchiefs and inferior silks, and of the best kind 307,235; 1860, all included, 142,909; 1863, 1,500 cloaks, 50,000 kerchiefs, &c., 231,870; 1864, 1,500 cloaks, 50,000 kerchiefs, &c., 265,720; which shows that the native manufacture in this branch has nearly returned to its normal state.

Adulterated Snuff.—In the manufacture of snuff known as "Irish" and "Welsh," the law permits the use of lime water; and some manufacturers have been in the habit of abusing this permission by using, not lime water alone, which is sufficient for the proper preparation of the snuff, but a thick mixture of that fluid and powdered lime, to an extent constituting an adulteration in its worst form, being physically injurious to the consumer, as well as a serious fraud on the Revenue. It is not easy to suppress this practice, from the fact that a certain but undefined amount of lime is necessary in the manufacture of the snuffs in question; it is consequently difficult to obtain a conviction upon an analysis of the finished article.

Commerce.

Sugar in Mauritius.—Notwithstanding the very unfavourable weather, 121,000 tons of sugar were exported from Mauritius last season, and the next crop promises to be a good one; improvements in agriculture and machinery have been effected on a large scale; many estates which have suffered from want of proper husbandry have changed hands, and much capital is being expended upon them. The difficulties imposed by the differential sugar duties upon all sugar growers who are anxious to improve their manufacture have not been so much felt in Mauritius, for although the fine sugar made there, and so much wanted here, is almost excluded from the English market by our fiscal arrangements, Australia and Bombay, where there are no shackles on intelligent manufacture, have as yet afforded a ready outlet for all the fine sugar made in Mauritius. Australia and Bombay together take nearly 50,000 tons, principally of crystallised vacuum pan sugar, and this gives some encouragement to those who have invested a large capital in improving manufacture. Of late the efforts of the planters to reduce the cost of the cultivation have been thwarted by the high price of rice, which is the principal food of the labouring classes, and is supplied to them in part payment of wages by their employers.

Spanish Wines.—The common Spanish wines (vins ordinaires) are deplorably bad—far inferior to the common wines of France, Sicily, Italy, and Hungary, and even to the pleasant malavisa of Crete (the original malvoisie), which is sold in that island at about 4d. per bottle. It is surprising that when so much trouble is taken in preparing sherry for the foreign market, the Spaniard should be content with such inferior and ill-made wines as are found in the neighbourhood of really good vineyards. Very common bad wine is sold to the peasant at 10d. and even 1s. 2d. per bottle, but such wine is most unpalatable. The vino-fino costs about 2s. to 2s. 8d. per bottle, and very ordinary sherry is sold at the Seville and Cadiz hotels at 4s. and 4s. 6d. per bottle. It is always difficult for a traveller in Spain to find good wine; and even in the Cadiz district he is generally obliged to put up with what is very indifferent. In no wine-growing country of Europe is such bad and dear vin ordinaire to be found as in the south of Spain. It is, in fact, all dear; the vino-fino and the good class of sherry is dear and good; the rest is dear also, and bad. Many persons think that the cultivation of the grape will gradually increase in Spain, and occupy a larger breadth of land than at present. This will probably, in some degree, depend on the prices obtained abroad for the wine exported. Just at present, the price is becoming lower, owing to the large stock of sherry held in London. It is doubtful whether a much larger area of land in Andalusia will (for many years, at least) be used for vineyards, there is such a lack of population in Spain. Although the present good sherry wine of this district is the result of a combination of fine climate and suitable soil, with more than 100 years' experience in its manufacture and management, yet eventually many other parts of Europe will probably compete with Andalusia in producing a white wine, similar if not equal to ordinary sherry; and Hungary and Croatia will, in after years, when the careful management and manipulation of wine is better understood in those countries, be able largely to export a similar class of dry and wholesome wines, probably at a cheaper rate than Andalusia.

The Bamboo as a Paper Material.—The bamboo, which grows abundantly in most of the West India islands, has been for some time past largely exported from Jamaica to New York in bales and bundles for the purpose of being manufactured into paper, and has proved equally as valuable as rags. The value of the bamboos growing in Jamaica has been estimated as high as £150,000. The bulk of the article stood hitherto, however, in the way of shipment. Made up into bundles of large dimensions, the hold of a vessel was soon filled, and captains did not care to take it as freight, any vessels so laden becoming top-heavy. To prevent this, the vessel had first to be stored with heavy cargo on her ground tier, thus allowing less space for bamboo. To obviate this, efforts have lately been made with success in the island to crush the bamboo between the mill rollers, and, by screw pressing, pack it into bales, as is now done with esparto and other bulky fibres.

Pulza Oil.—Under this name, a considerable commerce is carried on in the Cape de Verd Islands, in the oil obtained from the seeds of the *Jatropha Curcas*, a

euphorbiaceous plant. The tree which bears this fruit reaches the height of about 15 feet, and grows wild without irrigation in sheltered places in the arid land of the islands of St. Jago, St. Nicholas, Fogo, and Bravo. About 350,000 bushels of the seed are gathered and exported annually to Portugal, where the oil extracted is called purqueira oil, and is used principally for burning. In British commerce it is usually known as seed oil. The plant is easily propagated, either by cuttings or seed.

Wine.—The quantity of wine imported in the first six months of this year was 8,493,240 gallons, as compared with 7,025,828 gallons in the corresponding period of 1865, and 8,264,211 gallons in the corresponding period of 1864. Of the total imports this year 3,995,451 gallons were red wine, as compared with 3,263,987 gallons and 3,070,108 gallons in the corresponding periods of 1865 and 1864. The imports of French wine appear to be steadily increasing, haviug amounted to 1,286,256 gallons of red wine and 528,987 gallons of white wine to June 30th this year, as compared with 943,811 gallons of red and 487,397 gallons of white wine to the corresponding date of 1865, and 907,320 gallons of red and 464,957 gallons of white wine to the corresponding date of 1864. The imports of wine have considerably increased this year from Portugal and Spain. The arrivals from British colonies, which were never very large, have, however, been further curtailed. Spain sent us to June 30th this year 669,244 gallons of red wine, and 3,190,710 gallons of white wine, the totals in the first half of 1865 being 492,888 gallons, and 2,475,773 gallons, and in the first half of 1864, 446,099 gallons and 4,073,545 gallons.

Colonies.

The Vine in New South Wales.—The principal increase in the vine cultivation in this colony has been to the westward of the main range, and it is from that quarter, in the opinion of some competent judges, that, in future, chief supplies of the best wine are to be expected. The coast country is said to labour under two disadvantages; first, there is too little lime in the soil (a defect, however, which can be remedied by the application of bone dust or phospho-guano); secondly, there is too frequently rainy weather at the vintage. This latter is an objection that cannot be conquered, and it places the vine-growers completely at the mercy of the seasons. For making good wine it is desirable that the grapes should not be gathered till they are dead ripe; but if the vine-grower is in daily dread of heavy rain, he is tempted to pluck the fruit before it has attained a thorough maturity. The quantity of wine this year is said to be a little short, from the want of sufficient rain to swell the grapes, but the quality is excellent. So good a vintage season has not been known for several years.

Postal Arrangements in Victoria.—There are 525 post-offices in Victoria, being an increase of 200 in five years. The total number of letters received and despatched during 1862, amounted to 6,276,000; in 1865, [illegible]485,000. Newspapers, however, also show an increase of nearly 1,500,000 in three years. The number of packets despatched and received during 1865 amounted to [illegible]7,888. The increase is attributable to the more liberal regulation in regard to printed matter passing through the post. The epistolary correspondence of Victoria is much less per head than in England.

Queensland Coffee.—At the local exhibition of articles to be forwarded from this colony to the Melbourne and Paris Exhibitions, a sample of coffee was exhibited of colonial growth, consisting of green berries, plump, of good size, and evidently sound quality, grown in the Brisbane Botanical Gardens; also a sample grown at Kangaroo Point.

Australian Defences.—A proposal has been made public by the Australian agents for some iron works in Sweden to supply one or two more iron-clad turret floating batteries of the class known as Ericsson's monitor, at a cost said to be quite within the means of the colonists; and the great interests that might be placed in jeopardy in the event of a war between the United Kingdom and a maritime power has caused this proposition to be submitted to public discussion. Whether such a means of defence would alone be sufficient—whether shore batteries would be preferable, or whether, as seems most probable, a combination of both would best meet the object in view, remain at present mere matters of opinion.

Queensland Cotton.—A Brisbane paper says:—"The first inspection of cotton made in Brisbane during this season was gone through at Raff's Wharf, by the Government inspector. The lot comprised 100 bales from Townsville, on the Logan River, and a small parcel ginned for smaller growers. The Townsville cotton, with the exception of three bales of Sea Island, was wholly of the New Orleans or short-staple variety. Its quality is unexceptionable, the fibre is sound, of good colour, and perfectly free from stains, while the ginning is all that can be desired. The estimated value of the cotton is 1s. 8d. per pound."

Canterbury Sheep.—The total number of sheep in the province of Canterbury, on the 1st of January, 1866, was 1,735,416, against 1,433,644 on same date 1865, showing an increase of 301,772. It appears there are 35 stations in the northern district, with 354,405 sheep, and 87 in the central, with 651,947, and 50 in the southern, with 629,443 sheep.

Public Works in New South Wales.—A sum of £10,000 having been voted by the Parliament for the improvement of the Rivers Murray, Murrumbidgee, and Darling, active measures have been taken for carrying out the work. Clearing parties have been formed for cutting away and removing the snags and other obstructions that impede the navigation of the rivers. An extensive scheme of improvement to Darling Harbour has been proposed by the Engineer-in-Chief for Harbours and Rivers, and submitted to the Government. It is proposed to construct a range of wharves to enclose the whole of the head of Darling Harbour, with a view to the establishment of a railway terminus there, and in connection with it to deepen the whole of that part of the harbour to twenty feet, so that vessels of the largest class may lie alongside the wharves to discharge or take in cargo. In the event of this scheme being carried out, many of the large London ships with goods for the country would doubtless discharge at one of these wharves, where they would be enabled to transfer cargo from their holds into railway trucks without any intermediate carriage; and they would also be in a position to take in, from the railway trucks, the produce of the country. It is the intention of the chiefs of the Works Department to have, if possible, all the more important public works in the colony photographed for the Paris Exhibition of 1867. This would undoubtedly be one of the most effectual means of exhibiting the importance of the colony, and the progress made within the last few years.

Notes.

London Street Names.—A blue-book has been issued by the Metropolitan Board of Works, giving returns of the names of streets in the metropolis as regulated by the orders of the Board since 1856. These returns show that from 1857 to May in the present year, 46,879 houses were re-numbered, 2,110 subsidiary names of streets were abolished on re-naming or re-numbering the whole street, and 824 new streets have been approved from time to time under the Metropolis Local Management Act.

The New Act on the Carriage and Deposit of Dangerous Goods.—The new act to amend the law with respect to the carriage and deposit of dangerous goods has been published. Nitro-glycerine is declared to be specially dangerous, and other goods, by an order in council, may be deemed dangerous, and such goods

are to be specially marked, and a notice given of their character, and any person who commits a breach wilfully is to be liable to a penalty of £500, or two years' imprisonment. The term carrier is to include persons or bodies carrying goods or passengers by land or water.

Austria and the Paris Exhibition of 1867.—The *Mémorial Diplomatique* says:—"We regret to announce, on the authority of letters from Vienna, that the participation of Austria in the Paris Universal Exhibition of next year is very doubtful. The principal manufactories of that empire are carried on in Bohemia and Moravia, and those provinces have been literally ravaged by the Prussian occupation. A large number of objects intended for the Exhibition of Paris have been carried off by the Prussians; and, on the other hand, the exactions and contributions of all kinds imposed on the populations prevent the manufacturers of those districts from making any sacrifices to appear with honour in the general competition of 1867. Rather than be seen in a situation of undoubted inferiority, the Austrian manufacturers prefer to abstain from taking part in the Paris Exhibition, with the intention of reserving their efforts for that which is proposed to take place at Vienna in 1870."

Oxygen Extracted from the Air.—Mons. Tessié du Mothay has invented a process for obtaining a supply of oxygen from the atmosphere, which he proposes to show in operation in the Exhibition of 1867. The process is stated to be extremely cheap, and adapted to the production of gas on a large scale. Permanganate of soda is the agent employed. A solution of this salt is placed, under proper conditions and at a suitable temperature, to be traversed by a current of air, by means of which the oxygen of the air is seized upon by the solution, and the nitrogen is set free. When sufficiently saturated with oxygen, the current of air is replaced by a current of steam, which, without decomposition, drives off the oxygen almost absolutely pure. The permanganate solution, which by the condensed steam has become diluted, is then concentrated by the addition of fresh salt, and the operation repeated.

Demolitions in Paris.—The Hôtel Laffitte and twenty other houses are about to be demolished in order to extend the Rue Lafayette to the new Opera House now in course of erection, and the sums allowed to the proprietors by the juries amount to more than £548,000. The Hôtel Laffitte is almost historical; it was the property of the famous banker of that name, and in the grand *salon* was composed the Constitution of 1830. M. Laffitte was ruined by the revolution, and his hôtel put up to sale by auction, when it was purchased by the nation and presented to its late proprietor as a token of national gratitude for his efforts in the cause of liberty; a marble tablet, recording the fact, formerly affixed to the front of the house, may now be seen in the courtyard. It was afterwards inhabited by the family of Marshal Ney. The sum paid for this property was £92,000; in other cases the award was equal to £88,000, £64,000, and £44,000; the occupiers of these various houses received by way of compensation for removal in three cases, £8,000; in others, £4,600, £3,200, £2,200, £2,000, down to £200.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 7th August*, 1866.

425. Chain Cables and Anchors—Further Correspondence.
439. Foreshores (Scotland)—Correspondence.
456. Schoolmasters (Ireland)—Return.
463. Scottish Records—Letter.
464. Private Bills (Referees)—Return.
472. Militia (Ireland)—Return.
478. Labouring Classes Dwelling Houses Act (1866)—Rules, &c.

Delivered on 8th August, 1866.

293. Coinage—Report by Mr. H. W. Chisholm.
449. Master and Servant—Report.
450. Caledonian Canal—Sixty-first Report of the Commissioners.

Delivered on 9th August, 1866.

381. Steam Vessels—Return.
470. Cattle Diseases (Ireland) Act—Order in Council.
473. Cattle Plague—Five Orders in Council.
Vagrancy—Reports by Poor-law Inspectors.
Workhouse Dietaries—Report by Dr. Edward Smith.
Foreign Countries—Statistical Tables, Part 10.

Delivered on 10th August, 1866.

355. Industrial and Provident Societies—Return.
457. Navy Contracts—Return.
Ecclesiastical Corporations in Italy—Correspondence respecting the Suppression.

Patents.

From Commissioners of Patents' Journal, August 10th.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—1949—J. C. Haddan.
Bedsteads, fastening for—1973—W. E. Gedge.
Electric telegraph apparatus—1867—C. and S. A. Varley.
Files, cutting—1987—J. Talabot.
Fire-arms, revolver—1959—J. Adams.
Furnaces, combustion of fuel in—1985—W. E. Newton.
Hoops, metallic—1975—J. Pool.
Lamps—1744—J. Jackson.
Paper bags—1965—T. and J. Bibby.
Railways, permanent way of—1951—W. Seaton.
Railway signals—1963—J. McKenzie, T. Clunes, and W. Holland.
Safes—1977—E. I. Billing.
Saws, apparatus for sharpening—1943—E. H. Bentall.
Sewing machines—1947—J. P. Hubbard and C. Adams.
Shuttles—1967—T. Bullough and G. Openshaw.
Steam boilers, regulating water-supply—1955—C. D. Abel.
Steam generators—1941—H. A. Bonneville.
Tenoning machines—1983—G. H. Couch.
Traction engines—1957—J. P. Smith.
Weaving, ornamental—1953—J. Orr.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Horse-shoes—1999—H. J. Batchelder.
Horse road scraper—2020—W. Smith.

PATENTS SEALED.

434. C. D. Abel.
439. F. P. Warren.
445. W. Young.
452. W. Brown and C. N. May.
455. J. Vero.
462. S. Mason.
465. J. Holding and P. Todd.
468. J. Barlow.
470. R. B. Pilliner.
475. W. N. Wilson.
476. E. T. Hughes.
477. J. Rothery.
490. E. Dreveton.
504. J. Fletcher.
506. J. Wolstenholme and J. T. Pendlebury.
552. J. C. and H. G. Haddan.
592. W. Clark.
728. W. E. Newton.
1582. H. J. Griswold.

From Commissioners of Patents' Journal, August 14th.

PATENTS SEALED.

478. J. Young.
479. T. Adams and G. J. Parson.
485. G. Bedson.
495. J. Paterson.
496. P. E. Placet.
498. E. J. C. Welch.
507. S. Nelson.
508. H. Willis and G. Rice.
513. J. Kidd.
516. P. Smith.
518. E. M. du Boys.
521. A. Moore.
550. C. de Cassaria.
568. G. E. Donisthorpe.
570. C. Mather.
589. C. E. Treadwin.
667. J. Gray.
861. W. L. and T. Winans.
921. J. Davis.
1141. F. Barnett.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1944. G. E. Charageat.
1970. R. Dickson.
1977. D. W. Barker.
1998. C. C. Dennett.
1964. H. R. Brown.
1966. J. W. Armstrong.
1978. J. T. King.
1988. J. Cornforth & A. Andrew.
1995. R. S. Newall.
2036. J. Smith.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1836. J. Cannon.
1849. W. Muir.
1878. C. Mather.

Registered Designs.

Part of a Pencil Case—July 19th—4800—J. Munro and D. Haslett, 42, John-street, Fitzroy-square, W.
Table Catch—August 6th—4801—T. Atkins and Son, Bartholomew-row, Birmingham.
Stalking Coat—August 8th—4802—T. J. Dobson, 33, Burlington-road, St. Stephen's-square, W.
Bottle Holder—4803—C. J. Mejeran, 33, Oriental-place, Brighton.

Journal of the Society of Arts.

FRIDAY, AUGUST 24, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Proceedings of Institutions.

Llanelly Mechanics' Institution.—The nineteenth annual report, presented at the annual general meeting, held on the 24th of April last, says that for five years past here has been a steady increase in the income of the Institution. The balance-sheet shows an excess of receipts over expenditure in the year of £75 4s. There was a balance of £35 8s. 2d. in hand from the previous year, and he receipts from subscriptions were £191 19s. 6d. 59 fresh members have been added during the year. The resent list shows nearly 600 members, and of these 549 re annual subscribers. The occupations of the present members are given in the following return, which shows considerable increase of engine-fitters, iron-workmen, nd potters, viz.:—107 agents and clerks, 87 fitters and niths, 53 iron-workmen, 45 potters, 39 copper and ad-men, 32 merchants, 31 shopkeepers, 27 masons nd carpenters, 19 mariners, 19 shopkeepers' assistants 3 colliers, 15 tin-plate workers, 13 teachers, 13 ministers of religion, 12 labourers, 12 ladies, 9 surveyors, 7 printers, 6 solicitors and surgeons, 5 magistrates, 5 innkeepers, 4 farmers, 3 painters, 3 members Parliament, 3 army and navy officers, 3 police-constables, 3 shoemakers, 1 shipbuilder, total, 593. ıe reading-room is altogether inadequate to meet the owing requirements of the members, and is often ercrowded. Ten lectures were delivered in the session, viz., five prefessional lectures as follows:—On Mania," by Rev. J. B. Owen, M.A.; on "The ture of Good Food," by E. Lankester, Esq., M.D.; "Wise Saws and Modern Instances," by the Rev. J. Lance; Readings, by the Rev. J. M. Bellew; on Thomas Hood," by Walter Rowton, Esq.; and three ateur lectures; two Welch lectures were also given. sum of £27 16s. 4d. was received for admission, le the disbursements amounted to £42 14s. 6d. In rence to the library, the statistics of circulation w a total increase of 825 issues for the year; the nbers being 5,324 as against 4,499 in the previous r. The largest increase has been in the section of nce and art. During the last few years the income the Institution has risen from £52 9s. 10d. to 1 19s. 6d. per annum, and the number of members increased from 145 to nearly 600. The committee :—"It is impossible to have watched the growth of Institution year by year without feeling assured one of the main springs of its great prosperity t be sought in the qualifications of the gentleman Mainwaring) who has, during this period, filled the of principal honorary secretary."

EXAMINATION PAPERS, 1866.

ıe following are the Examination Papers set in the ous subjects at the Society's Final Examinations, in April last:—

(*Continued from page* 626).

POLITICAL AND SOCIAL ECONOMY.

THREE HOURS ALLOWED.

Questions from Stephens's Commentaries.

1. Under what different heads does Stephens consider right in private relations.
2. How far is marriage in England a civil, and how far is it a religious contract?
3. What are by the common law the rights of the husband to the property of his wife, distinguishing between land, and money or other personal property?
4. At what time does the right of the father to the control over the persons of his children cease, and by what act may that control be sooner taken away?
5. What do you mean by Parliament?
6. What are the chief privileges of Parliament?
7. What is the title of her Majesty to the throne of this kingdom?
8. What are the duties of the Sovereign to the people, and how are they defined by the Coronation Oath?
9. Describe the offices of sheriff and coroner.

Questions from Professor Fawcett's Manual, for those who aspire to a First-Class Certificate.

1. How does Mr. Fawcett divide commodities with reference to the causes which regulate their price?
2. Give the history and explain the use of the co-operative system in its different forms.
3. What are the functions of credit, and is it rightly considered to be capital?
4. What determines the rate of wages, and why cannot this rate be permanently or beneficially affected by law?
5. What are the different advantages, according to different circumstances, of farming on a large and on a small scale?
6. Explain the incidence of the land tax, tithe rent charge, and rates chargeable on the occupation of land and houses. Is there any and what difference between land and houses in respect of this incidence?

GEOGRAPHY.

THREE HOURS ALLOWED.

1. Describe briefly the general distribution of high and low ground in Great Britain, naming the counties in which the principal hill-ranges are situated.
2. Mention, in the case of Great Britain and Ireland, the cities and towns that constitute great seats of manufacturing industry (cotton, woollen, linen, hardware, earthenware), naming the county to which each belongs; also name six or more of the principal seaports of Britain, describing their situations.
3. Describe briefly the physical geography of either France, Italy, or Germany—boundaries, mountains, plains, rivers-basins, and climate. (N.B. If you prefer it, draw a map of any one of those countries, embodying, as to natural features, the required information.)
4. Give some account of the Mediterranean Sea—naming the countries that lie around its basin, and the chief seaports situated on its shores.
5. Give a brief description of the physical features of India—distribution of high and low grounds, river-basins, &c., with the leading conditions of its climate.
6. Name the principal towns that lie within the valley of the Ganges—the valley of the Indus—on the plateau-lands of the Deccan—and upon the Malabar and Coromandel coasts respectively. Say which among them are most distinguished by size and population.
7. Specify the distinguishing conditions in the physical features, climate, and natural productions, of the Australian continent.
8. Draw a map either of New South Wales, Victoria, or Tasmania—marking on it the direction of the high grounds, courses of the principal rivers, and positions of the principal towns.
9. Describe briefly the natural features of New Zealand:

name also the provinces into which either island is respectively divided, with the chief town of each.

10. State the received conditions which account for the existence of ocean currents; name the principal currents of the Atlantic, describing particularly the course of the Gulf Stream.

11. To what causes are differences of climate to be chiefly assigned? Account for the differences in point of temperature between Tibet and the valley of the Ganges, between Lapland and Egypt, between the cities of Quito and Panama, between Central Africa and Polynesia.

12. Give some account of the geographical distribution of regions of subterranean disturbance (earthquakes and volcanic eruptions): name three or more of the principal active volcanos of either hemisphere, stating their localities.

ENGLISH HISTORY.

THREE HOURS ALLOWED.

1. Give the dates of the following events:—The landing of Cæsar in Britain; the invasion of the Anglo-Saxons; the mission of St. Augustine; the Norman Conquest; the Accession of Henry II.; Magna Charta; the Accession of Henry VII.,—of James I.; the flight of James II.; the Bill of Rights; the death of Queen Anne; the conquest of Wales; the union of Scotland; the union of Ireland.

2. What alterations were introduced into the administration of this country by the Normans?

3. Explain the dispute as to the right of investiture, in which William II. was involved.

4. Give a brief account of the objects of the dispute between Henry II. and Thomas à Becket.

5. Mention the principal clauses in Magna Charta.

6. What was the origin of the House of Commons? Show briefly what privileges it wrested successively from the sovereign, from its commencement to the reign of Henry VI.

7. What is meant by "The Royal Supremacy?" By whom was it first asserted? What did the kings of the Stuart line mean by the expression "The Royal prerogative?" How did the assertion of it bring out the opposite principle? When was it superseded?

8. State briefly what definite advantages were gained by Parliament for constitutional liberty, between 1625 and 1700.

9. Explain the purport of the two Acts of Settlement.

10. When did the party names of Whig and Tory arise? What is their origin? What names did they displace?

11. What was implied by the terms Jacobite, Nonjuror, Pretender? When did these names spring up, and when did they disappear?

*12. What were the effects of the French Revolution:—

(1.) On the two great political parties in England?
(2.) On the social condition of the lower classes here?

*13. What great changes have taken place in the industrial occupations of the working classes, in the 19th, as compared with the previous century? What have been the moral and social effects of such changes?

Special Subjects.

*** The first and second, or first and third, of these subjects to be answered, but not more.

1. The battle of Bouvines. The parties engaged in it, and its consequences.

2. A brief account of some of the more eminent men who flourished in the reign of Henry III.

3. An account of the controversy between Henry III. and his barons.

* Only one of these questions is to be answered.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, NOTTINGHAM, 1866.

The thirty-sixth meeting of the British Association commenced on Wednesday, the 23rd inst., under the presidency of William Robert Grove, Esq., Q.C., M.A., F.R.S.

The general committee met at the Mechanics' Hall at one o'clock, Professor Phillips, the retiring president, in the chair. The minutes of the last meeting at Birmingham were read and passed. The report of the council and the general committee was then read. It adds to the list of corresponding members the names of the following foreign men of science, viz.:—Captain Belavenetz, Geheimrath von Dechen, M. Gaudry, Prof. Grube, Prof. Kiepert, Prof. F. Romer, Chev. C. Negri, and Prof. Steenstrup. The names of Mr. J. Hind, F.R.S., and Mr. T. Close are added to the list of vice-presidents, and Mr. Thomas Archer Hirst, Ph.D., F.R.S., Professor of Mathematical Physics in University College, London, has been appointed joint general secretary. The report of the parliamentary committee consisted chiefly of complaints that the late session had passed without any steps being taken to promote the study of science in our public schools, while that of the Kew committee was very full and satisfactory, especially noting the appointment of a particular committee to consider and report on a comprehensive list of meteorological questions.

The number of members and associates enrolled up to Tuesday night was 1,290, and the receipts were £1,437. The number of members at Birmingham last year was 1,996, and the amount received was £2,227.

In the evening, at eight o'clock, Professor Phillips, the retiring president, having formally resigned the chair to his successor, Mr. W. R. Grove, that gentleman proceeded to deliver an address, of which the following are some of the most interesting portions:—

Every votary of physical science must be anxious to see it recognised by those institutions of the country which can to the greatest degree promote its cultivation and reap from it the greatest benefit. You will probably agree with me that the principal educational establishments on the one hand, and on the other the Government, in many of its departments, are the institutions which may best fulfil these conditions. The more early the mind is trained to a pursuit of any kind, the deeper and more permanent are the impressions received, and the more service can be rendered by the students.

Little can be achieved in scientific research without an acquaintance with it in youth; you will rarely find an instance of a man who has attained any eminence in science who has not commenced its study at a very early period of life. I desire to make no complaint of the tardiness with which science has been received at our public schools, and, with some exceptions, at our Universities. These great establishments have their roots in historical periods, and long time and patient endeavour is requisite before a new branch of thought can be grafted with success on a stem to which it is exotic. Nor should I ever wish to see the study of languages, of history, of all those refined associations which the past has transmitted to us, neglected; but there is room for both. It is sad to see the number of so-called educated men who, travelling by railway, voyaging by steamboat, consulting the almanac for the time of sunrise or full moon, have not the most elementary knowledge of a steam-engine, a barometer, or a quadrant; and who will listen with a half-confessed faith to the most idle predictions as to weather or cometic influences, while they are in a state of gross ignorance as to the cause of the trade winds or the form of a comet's path. May we hope that the slight infiltration of scientific studies, now happily commenced, will extend till it occupies its fair space in the education of the young, and that those who may be able learnedly to discourse on the Eolic digamma will not be ashamed of knowing the principles of an air-pump, an electrical machine, or a telescope, and will not

as Bacon complained of his contemporaries, despise such knowledge as something mean and mechanical.

To assert that the great departments of Government should encourage physical science may appear a truism, and yet it is but of late that it has been seriously done; now, the habit of consulting men of science on important questions of national interest is becoming a recognised practice, and in a time, which may seem long to individuals, but is short in the history of a nation, a more definite sphere of usefulness for national purposes will, I I have no doubt, be provided for those duly qualified men who may be content to give up the more tempting study of abstract science for that of its practical applications. In this respect the report of the Kew Committee for this year affords a subject of congratulation.

I do not propose on this occasion to recapitulate the special objects attained by the Association, this has been amply done by several of my predecessors; nor shall I confine my address to the progress made in physical science since the time when my most able and esteemed friend and predecessor addressed you at Birmingham.

I purpose, with your kind permission, to submit to you certain views of what has within a comparatively recent period been accomplished by science, what have been the steps leading to the attained results, and what, as far as we may fairly form an opinion, is the general character pervading modern discovery.

I need not dwell on the common-place but yet important topics of the material advantages resulting from the application of science; I will address myself to what, in my humble judgment, are the lessons we have learned, and the probable prospects of improved natural knowledge.

One word will give you the key to what I am about to discourse on; that word is *continuity*, no new word, and used in no new sense, but perhaps applied more generally than it has hitherto been. We shall see, unless I am much mistaken, that the development of observational, experimental, and even deductive knowledge is either attained by steps so extremely small as to form really a continuous ascent; or, when distinct results, apparently separate from any co-ordinate phenomena have been attained, that then, by the subsequent progress of science, intermediate links have been discovered uniting the apparently segregated instances with other more familiar phenomena. Thus, the more we investigate, the more we find that in existing phenomena graduation from the like to the seemingly unlike prevails, and in the changes which take place in time, gradual progress is, and apparently must be, the course of nature.

Let me now endeavour to apply this view to the recent progress of some of the more prominent branches of science.

In astronomy, from the time when the earth was considered a flat plain bounded by a flat ocean—when the sun, moon, and stars were regarded as lanterns to illuminate this plain—each successive discovery has brought with it similitudes and analogies between this earth and many of the objects of the universe with which our senses, aided by instruments, have made us acquainted. I pass, of course, over those discoveries which have established the Copernican system as applied to our sun, its attendant planets, and their satellites. The proofs, however, that gravitation is not confined to our solar system, but pervades the universe, have received many confirmations by the labours of members of this Association; I may name those who have held the office of President—Lord Rosse, Lord Wrottesley, and Sir J. Herschel, the two latter having devoted special attention to the orbits of double stars, the former to those probably more recent systems called nebulæ. There is another class of observations quite recent in its importance, and which has formed a special subject of contribution to the Reports and Transactions of this Association; I allude to those on Meteorites.

Dr. Olmsted explained the appearance of a point from which the lines of flight of meteors seem to radiate, as being the perspective vanishing point of their parallel or nearly parallel courses appearing to an observer on the earth as it approaches them. The uniformity of position of these radiant points, the many corroborative observations on the direction, the distances, and the velocities of these bodies, the circumstance that their paths intersect the earth's orbit at certain definite periods, and the total failure of all other theories which have been advanced, while there is no substantial objection to this, afford evidence almost amounting to proof that these are cosmical bodies moving in the interplanetary space by gravitation round the sun, and some, perhaps, round planets. This view gives us a new element of continuity. The universe would thus appear not to have the extent of empty space formerly attributed to it, but to be studded between the larger and more visible masses with smaller planets, if the term may be applied to meteorites.

The number of known asteroids, or bodies of a smaller size than what are termed the ancient planets, has been so increased by numerous discoveries, that instead of seven we now count eighty-eight as the number of recognized planets. If we add these, the smallest of which is only three or four miles in diameter—indeed cannot be accurately measured—and if we were to apply the same scrutiny to other parts of the heavens as has been applied to the zone between Mars and Jupiter, it is no far-fetched speculation to suppose that between these asteroids and the meteorites, bodies of intermediate size exist until the space occupied by our solar system becomes filled up with planetary bodies, varying in size from that of Jupiter (1,240 times larger in volume than the earth) to that of a cannon-ball or even a pistol-bullet.

The researches of Leverrier on the intra-mercurial planets come in aid of these views, and another half century may, and not improbably will, enable us to ascertain that the now seemingly-vacant interplanetary spaces are occupied by smaller bodies which have hitherto escaped observation. But the evidence of continuity as pervading the universe does not stop at telescopic observation; chemistry and physical optics bring us new proofs. Those meteoric bodies which have from time to time come so far within reach of the earth's attraction as to fall upon its surface, give on analysis metals and oxides similar to those which belong to the structure of the earth—they come as travellers bringing specimens of minerals from extra-terrestrial regions.

. . . .

While chemistry thus aids us in ascertaining the relationship of our planet to meteorites, its relation in composition to other planets, to the sun, and to more distant suns and systems is aided by another science—optics.

I need not detail to you the discoveries of Kirchhoff, Bunsen, Miller, Huggins, and others, they have been dilated on by my predecessor. Assuming that spectrum analysis is a reliable indication of the presence of given substances by the position of transverse bright lines exhibited when they are burnt and of transverse dark lines when light is transmitted through their vapours, though Plücker has shown that with some substances these lines vary with temperature, the point of importance in the view I am presenting to you is, that while what may be called comparatively neighbouring cosmical bodies exhibit lines identical with many of those shown by the components of this planet, as we proceed to the more distant appearances of the nebulæ we get but one or two of such lines, and we get one or two new bands not yet identified with any known to be produced by substances on this globe.

Within the last year Mr. Huggins has added to his former researches observations on the spectrum of a comet (comet 1 of 1866), the nucleus of which shows but one bright line, while the spectrum formed by the light of the coma is continuous, seeming to show that the

nucleus is gaseous while the coma would consist of matter in a state of minute division shining by reflected light: whether this be solid, liquid, or gaseous is doubtful, but the author thinks it is in a condition analogous to that of fog or cloud. The position in the spectrum of the bright line furnished by the nucleus is the same as that of nitrogen, which also is shown in some of the nebulæ.

But the most remarkable achievement by spectrum analysis is the record of observations on a temporary star which has shone forth this year in the constellation of the northern crown about a degree S.E. of the star ϵ. When it was first seen, May 12th, it was nearly equal in brilliancy to a star of the second magnitude; when observed by Mr. Huggins and Dr. Miller, May 16th, it was reduced to the third or fourth magnitude. Examined by these observers with the spectroscope, it gave a spectrum which they state was unlike that of any celestial body they had examined.

There is strong reason to believe that this star is one previously seen by Argelander and Sir J. Herschel, and that it is a variable star of long or irregular period; it is also notable that some of its spectrum lines correspond with those of several variable stars.

It would seem as if the phenomenon of gradual change obtained towards the remotest objects with which we are at present acquainted, and that the further we penetrate into space the more unlike to those we are acquainted with become the objects of our examination—sun, planets, meteorites, earth similarly though not identically constituted, stars differing from each other and from our system, and nebulæ more remote in space and differing more in their characters and constitution.

While we thus can to some extent investigate the physical constitution of the most remote visible substances, may we not hope that some further insight as to the constitution of the nearest, viz., our own satellite, may be given us by this class of researches? The question whether the moon possesses any atmosphere may still be regarded as unsolved. If there be any, it must be exceedingly small in quantity and highly attenuated. Supposing the moon to be constituted of similar materials to the earth, it must be, to say the least, doubtful whether there is oxygen enough to oxidate the metals of which she is composed; and if not, the surface which we see must be metallic, or nearly so. The appearance of her craters is not unlike that seen on the surface of some metals, such as bismuth, or, according to Professor Phillips, silver, when cooling from fusion and just previous to solidifying; and it might be a fair subject of inquiry whether, if there be any coating of oxide on the surface, it may not be so thin as not to disguise the form of the congealed metallic masses, as they may have set in cooling from igneous fusion.

. . . .

After touching upon some other points of lunar physics, the President said:—

Before quitting the subject of astronomy I cannot avoid expressing a feeling of disappointment that the achromatic telescope, which has rendered such notable service to this science, still retains in practice the great defect which was known a century ago at the time of Hall and Dollond, namely, the inaccuracy of definition arising from what was termed the irrationality of the spectrum, or the incommensurate divisions of the spectra formed by flint and crown glass; and, notwithstanding the greatly improved manufacture, the defect to which I have adverted remains unremedied.

We have now a large variety of different kinds of glass formed from different metallic oxides. A list of many such was given by M. Jacquelain a few years back; the last specimen which I have seen is a heavy highly refracting glass formed from the metal thallium by M. Lamy. Among all these could no two or three be selected which, having appropriate refracting and dispersing powers, would have the coloured spaces of their respective spectra, if not absolutely in the same proportions, at all events much more nearly so than those of flint and crown glass? Could not, again, oily or resinous substances having much action on the green or middle colour of the spectrum, such as castor oil, canada balsam, &c., be made use of in combination with glass lenses to reduce if not annihilate this signal defect? This is not a problem to the solution of which there seems any insuperable difficulty; it is worth labouring for, as, could the defect be remedied, the refracting telescope would make nearly as great an advance upon its present state as the achromatic did on the single-lens refractor.

While gravitation, physical constitution, and chemical analysis by the spectrum show us that matter has similar characteristics in other worlds than our own, when we pass to the consideration of those other attributes of matter which were at one time supposed to be peculiar kinds of matter itself, or, as they were called, imponderables, but which are now generally, if not universally, recognised as forces or modes of motion, we find the evidence of continuity still stronger.

When all that was known of magnetism was that a piece of steel rubbed against a particular mineral had the power of attracting iron, and, if freely suspended, of arranging itself nearly in a line with the earth's meridian, it seemed an exceptional phenomenon. When it was observed that amber, if rubbed, had the temporary power of attracting light bodies, this also seemed something peculiar and anomalous. What are now magnetism and electricity? forces so universal, so apparently connected with matter as to become two of its invariable attributes, and that to speak of matter not being capable of being affected by these forces would seem almost as extravagant as to speak of matter not being affected by gravitation. So with light, heat, and chemical affinity, not merely is every form of matter with which we are acquainted capable of manifesting all these modes of force, but so-called matter supposed incapable of such manifestations would to most minds cease to be matter.

Further than this it seems to me (though, as I have taken an active part for many years, now dating from a quarter of a century, in promoting this view, I may not be considered an impartial judge) that it is now proved that all these forces are so invariably connected *inter se* and with motion as to be regarded as modifications of each other, and as resolving themselves objectively into motion, and subjectively into that something which produces or resists motion, and which we call force.

. . . .

It would be out of place here to trace how, by the labours of Oersted, Seebeck, Faraday, Talbot, Daguerre, and others, the way has been prepared for the generalization now known as the correlation of forces or conservation of energy, while Davy, Rumford, Seguin, Mayer, Joule, Helmholtz, Thomson, and others (among whom I would not name myself, were it not that I may be misunderstood and supposed to have abandoned all claim to a share in the initiation of this, as I believe important generalization) have carried on the work: and how, sometimes by independent, and, as is commonly the case, nearly simultaneous deductions, sometimes by progressive and accumulated discoveries, the doctrine of the reciprocal interaction, of the quantitative relation, and of the necessary dependence of all the forces has, I think I may venture to say, been established.

If magnetism be, as it is proved to be, connected with the other forces or affections of matter, if electrical currents always produce, as they are proved to do, lines of magnetic force at right angles to their lines of action, magnetism must be cosmical, for where there is heat and light, there is electricity and consequently magnetism. Magnetism, then, must be cosmical and not merely terrestrial. Could we trace magnetism in other planets and suns as a force manifested in axial or meridional lines, *i.e.*, in lines cutting at right angles the curves formed by their rotation round an axis, it would be a great step; but it is one hitherto unaccomplished.

One of the most startling suggestions as to the consequence resulting from the dynamical theory of heat is that made by Mayer, that by the loss of *vis viva* occasioned by friction of the tidal waves, as well as by their forming, as it were, a drag upon the earth's rotatory movement, the velocity of the earth's rotation must be gradually diminishing, and that thus, unless some undiscovered compensatory action exist, this rotation must ultimately cease, and changes hardly calculable take place in the polar system.

M. Delaunay considers that part of the acceleration of the moon's mean motion which is not at present accounted for by planetary disturbances, to be due to the gradual retardation of the earth's rotation; to which view, after an elaborate investigation, the Astronomer Royal has given his assent.

Another most interesting speculation of Mayer is that the heat of the sun is occasioned by friction or percussion of meteorites falling upon it: there are some difficulties, not perhaps insuperable, in this theory. Supposing such cosmical bodies to exist in sufficient numbers they would, as they revolve round the sun, fall into it, not as an aërolite falls upon the earth directly by an intersection of orbits, but by the gradual reduction in size of the orbits, occasioned by a resisting medium; some portion of force would be lost, and heat generated in space by friction against such medium; when they arrive at the sun they would, assuming them, like the planets, to have revolved in the same direction, all impinge in a definite direction, and we might except to see some symptoms of such in the sun's photosphere; but though this is in a constant state of motion, and the direction of these movements has been carefully investigated by Mr. Carrington and others, no such general direction is detected; and M. Faye, who some time ago wrote a paper pointing out many objections to the theory of solar heat being produced by the fall of meteoric bodies into the sun, has recently investigated the proper motions of sun-spots, and believes he has removed certain apparent anomalies and reduced their motions to a certain regularity in the motion of the photosphere, attributable to some general action arising from the internal mass of the sun.

Assuming the undulatory theory of light to be true, and that the motion which constitutes light is transmitted across the interplanetary spaces by a highly elastic ether, then, unless this motion is confined to one direction, unless there be no interference, unless there be no viscosity, as it is now termed, in the medium, and consequently no friction, light must lose something in its progress from distant luminous bodies, that is to say, must lose something as light; for, as all reflecting minds are now convinced that force cannot be annihilated, the force is not lost, but its mode of action is changed. If light, then, is lost as light (and the observations of Struvé seem to show this to be so, that, in fact, a star may be so far distant that it can never be seen in consequence of its luminous emissions becoming extinct), what becomes of the transmitted force lost as light, but existing in some other form? So with heat; our sun, our earth, and planets are constantly radiating heat into space, so in all probability are the other suns, the stars, and their attendant planets. What becomes of the heat thus radiated into space? If the universe have no limit, and it is difficult to conceive one, there is a constant evolution of heat and light; and yet more is given off than is received by each cosmical body, for otherwise night would be as light and as warm as day. What becomes of the enormous force thus apparently non-recurrent in the same form? Does it return as palpable motion? Does it move or contribute to move suns and planets? and can it be conceived as a force similar to that which Newton speculated on as universally repulsive and capable of being substituted for universal attraction? We are in no position at present to answer such questions as these; but I know of no problem in celestial dynamics more deeply interesting than this, and we may be no further removed from its solution than the predecessors of Newton were from the simple dynamical relation of matter to matter which that potent intellect detected and demonstrated.

Passing from extra terrestrial theories to the narrower field of molecular physics, we find the doctrine of correlation of forces steadily making its way.

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In a practical point of view the power of converting one mode of force into another is of the highest importance, and with reference to a subject which at present, somewhat prematurely perhaps, occupies men's minds, viz., the prospective exhaustion of our coal-fields, there is every encouragement derivable from the knowledge that we can at will produce heat by the expenditure of other forces; but, more than that, we may probably be enabled to absorb or store up as it were diffused energy—for instance, Berthelot has found that the potential energy of formate of potash is much greater than that of its proximate constituents, caustic potash and carbonic oxide. This change may take place spontaneously and at ordinary temperatures, and by such change carbonic oxide becomes, so to speak, reinvested with the amount of potential energy which its carbon possessed before uniting with oxygen, or, in other words, the carbonic oxide is raised as a force-possessor to the place of carbon by the direct absorption or conversion of heat from surrounding matter.

Here we have as to force-absorption, an analogous result to that of the formation of coal from carbonic acid and water; and though this is a mere illustration, and may never become economical on a large scale, still it and similar examples may calm apprehension as to future means of supplying heat, should our present fuel become exhausted. As the sun's force, spent in times long past, is now returned to us from the coal which was formed by that light and heat, so the sun's rays, which are daily wasted, as far as we are concerned, on the sandy deserts of Africa, may hereafter, by chemical or mechanical means, be made to light and warm the inhabitants of the denizens of colder regions. The tidal wave is, again, a large reservoir of force hitherto almost unused.

The valuable researches of Prof. Tyndall on radiant heat afford many instances of the power of localizing, if the term be permitted, heat which would otherwise be dissipated.

The discoveries of Graham, by which atmospheric air, drawn through films of caoutchouc, leaves behind half its nitrogen, or, in other words, becomes richer by half in oxygen, and hence has a much increased potential energy, not only show a most remarkable instance of physical molecular action, merging into chemical, but afford us indications of means of storing up force, much of the force used in working the aspirator being capable at any period, however remote, of being evolved by burning the oxygen with a combustible.

What changes may take place in our modes of applying force before the coal-fields are exhausted it is impossible to predict. Even guesses at the probable period of their exhaustion are uncertain. There is a tendency to substitute for smelting in metallurgic processes, liquid chemical action, which of course has the effect of saving fuel; and the waste of fuel in ordinary operations is enormous, and can be much economised by already known processes. It is true that we are, at present, far from seeing a practical mode of replacing that granary of force the coal-fields; but we may with confidence rely on invention being in this case, as in others, born of necessity, when the necessity arises.

Two very remarkable applications of the convertibility of force have been recently attained by the experiments of Mr. Wilde and Mr. Holz; the former finds that, by conveying electricity from the coils of a magneto-electric machine to an electro-magnet, a considerable increase of electrical power may be attained, and by applying this

as a magneto-electric machine to a second, and in turn to a third electro-magnetic apparatus, the force is largely augmented. Of course, to produce this increase, more mechanical force must be used at each step to work the magneto-electric machines; but provided this be supplied there hardly seems a limit to the extent to which mechanical may be converted into electrical force.

Mr. Holz has contrived a Franklinic electrical machine, in which a similar principle is manifested. A varnished glass plate is made to revolve in close proximity to another plate having two or more pieces of card attached, which are electrified by a bit of rubbed glass or ebonite; the moment this is effected a resistance is felt by the operator who turns the handle of the machine, and the slight temporary electrization of the card converts into a continuous flood of intense electricity the force supplied by the arm of the operator.

These results offer great promise of extended application; they show that, by a mere formal disposition of matter, one force can be converted into another, and that not to the limited extent hitherto attained, but to an extent co-ordinate, or nearly so, with the increased initial force.

In physiology very considerable strides are being made by studying the relation of organised bodies to external forces; and this branch of inquiry has been promoted by the labours of Carpenter, Bence Jones, Playfair, E. Smith, Frankland, and others.

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These and many similar classes of research show that in chemical inquiries, as in other branches of science, we are gradually relieving ourselves of hypothetical existences. As phlogiston and similar creations of the mind have passed away, so with hypothetic fluids, imponderable matters, specific ethers, and other inventions of entities made to vary according to the requirements of the theorist, I believe the day is approaching when these will be dispensed with, and when the two fundamental conceptions of matter and motion will be found sufficient to explain physical phenomena.

The facts made known to us by geological inquiries, while on the one hand they afford striking evidence of continuity, on the other, by the breaks in the record, may be used as arguments against it. The great question once was, whether these chasms represent sudden changes in the formation of the earth's crust, or whether they arise from dislocations occasioned since the original deposition of strata, or from gradual shifting of the areas of submergence. Few geologists of the present day would, I imagine, not adopt the latter alternative.

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When we compare with the old theories of the earth, by which the apparent changes on its surface were accounted for by convulsions and cataclysms, the modern view inaugurated by Lyell, your former President, and now, if not wholly, at all events to a great extent adopted, it seems strange that the referring past changes to similar causes to those which are now in operation should have remained uninvestigated until the present century; but with this, as with other branches of knowledge, the most simple is frequently the latest view which occurs to the mind. It is much more easy to invent a *Deus ex machinâ* than to trace out the influence of slow continuous change; the love of the marvellous is so much more attractive than the patient investigation of truth, that we find it to have prevailed almost universally in the early stages of science.

In astronomy we had crystal spheres, cycles, and epicycles; in chemistry, the philosopher's stone, the elixir vitæ, the archæus or stomach demon, and phlogiston; in electricity, the notion that amber possessed a soul, and that a mysterious fluid could knock down a steeple. In geology, a deluge or volcano was supplied. In palæontology a new race was created whenever theory required it; how such new races began, the theorist did not stop to inquire.

A curious speculator might say to a palæontologist of even recent date, in words freely paraphrased from Lucretius:—"You have abandoned the belief in one primæval creation at one point of time, you cannot assert that an elephant existed when the first saurians roamed over earth and water. Without, then, in any way limiting Almighty power, if an elephant were created without progenitors, the first elephant must, in some way or other, have physically arrived on this earth. Whence did he come? did he fall from the sky (*i.e.*, from the interplanetary space)? did he rise moulded out of a mass of amorphous earth or rock? did he appear out of the cleft of a tree? If he had no antecedent progenitors, some such beginning must be assigned to him." I know of no scientific writer who has, since the discoveries of geology have become familiar, ventured to present, in intelligent terms, any definite notion of how such an event could have occurred; those who do not adopt some view of continuity are content to say God willed it; but would it not be more reverent and more philosophical to inquire by observation and experiment, and to reason from induction and analogy, as to the probabilities of such frequent miraculous interventions?

I know I am touching on delicate ground, and that a long time may elapse before that calm inquiry after truth, which it is the object of associations like this to promote, can be fully attained; but I trust that the members of this body are sufficiently free from prejudice, whatever their opinions may be, to admit an inquiry into the general question whether what we term species are and have been rigidly limited, and have at numerous periods been created complete and unchangeable, or whether, in some mode or other, they have not gradually and indefinitely varied, and whether the changes due to the influence of surrounding circumstances, to efforts to accommodate themselves to surrounding changes, to what is called natural selection, or to the necessity of yielding to superior force in the struggle for existence, as maintained by our illustrious countryman Darwin, have not so modified organisms as to enable them to exist under changed conditions.

The President then discussed at some length the main arguments for and against continuity as applied to the history of organic beings.

As we detect no such phenomenon as the creation or spontaneous generation of vegetables and animals, which are large enough for the eye to see without instrumental assistance, the field of this class of research has become identified with the field of the microscope, and at each new phase the investigation has passed from a larger to a smaller class of organisms. The question whether among the smallest and apparently the most elementary forms of organic life the phenomenon of spontaneous generation obtains, has recently formed the subject of careful experiment and animated discussion in France. Although we see no such phenomenon as the formation of an animal such as an elephant, or a tree such as an oak, excepting from a parent which resembles it, yet if the microscope revealed to us organisms smaller but equally complex, so formed without having been reproduced, it would render it not improbable that such might have been the case with larger organic beings. The controversy between M. Pasteur and M. Pouchet has led to a very close investigation of the subject, and the general opinion is that when such precautions are taken as exclude from the substance submitted to experiment all possibility of germs from the atmosphere being introduced, as by passing the air which is to support the life of the animalculæ through tubes heated to redness and other precautions, no formation of organisms takes place. Some experiments of Mr. Child's, communicated to the Royal Society during the last year, again throw doubt on the negative results obtained by M. Pasteur; so that the question may be not finally determined, but the balance of experiment and opinion is against spontaneous generation.

Actual experiment, however, seems to have done little to elucidate the question, nor, unless we can suppose the experiments continued through countless generations, is it likely to contribute much to its solution. We must therefore have recourse to the enlarged experience or induction from the facts of geology, palæontology, and physiology, aided by analogy from the laws of action which nature evidences in other departments.

The President then gave an outline of the arguments on this subject, deducible from the present state of these sciences, and concluded as follows:—

The recent discoveries in palæontology show us that man existed on this planet at an epoch far anterior to that commonly assigned to him. The instruments connected with human remains, and indisputably the work of human hands, show that to these remote periods the term civilisation could hardly be applied—chipped flints of the rudest construction, probably in the earlier cases fabricated by holding an amorphous flint in the hand, and chipping off portions of it by striking it against a larger stone or rock; then, as time suggested improvements, it would be more carefully shaped, and another stone used as a tool; then (at what interval we can hardly guess) it would be ground, then roughly polished, and so on,—subsequently bronze weapons, and nearly the last before we come to historical periods, iron. Such an apparently simple invention as a wheel must, in all probability, have been far subsequent to the rude hunting tools or weapons of war to which I have alluded.

A little step-by-step reasoning will convince the unprejudiced that what we call civilisation must have been a gradual process. Can it be supposed that the inhabitants of Central America or of Egypt suddenly and what is called instinctively built their cities, carved and ornamented their monuments? If not, if they must have learned to construct such erections, did it not take time to acquire such learning, to invent tools as occasion required, contrivances to raise weights, rules or laws by which men acted in concert to effect the design? Did not all this require time? And if, as the evidence of historical times shows, invention marches with a geometrical progression, how slow must have been the earlier steps. If even now habit, and prejudice resulting therefrom, vested interests, &c., retard for some time the general application of a new invention, what must have been the degree of retardation among the comparatively uneducated beings which then existed?

If I appear to lean to the view that the successive changes in organic beings do not take place by sudden leaps, it is, I believe, from no want of an impartial feeling; but if the facts are stronger in favour of one theory than another, it would be an affectation of impartiality to make the balance appear equipoised.

The prejudices of education and associations with the past are against this as against all new views; and while on the one hand a theory is not to be accepted because it is new and *primâ facie* plausible, still to this assembly I need not say that its running counter to existing opinions is not necessarily a reason for its rejection; the *onus probandi* should rest on those who advance a new view, but the degree of proof must differ with the nature of the subject. The fair question is, Does the newly proposed view remove more difficulties, require fewer assumptions, and present more consistency with observed facts than that which it seeks to supersede? if so, the philosopher will adopt it, and the world will follow the philosopher—after many days.

It must be borne in mind that even if we are satisfied, from a persevering and impartial inquiry, that organic forms have varied indefinitely in time, the *causa causans* of these changes is not explained by our researches; if it be admitted that we find no evidence of amorphous matter suddenly changed into complex structure, still why matter should be endowed with the plasticity by which it slowly acquires modified structure is unexplained. If we assume that natural selection, or the struggle for existence, coupled with the tendency of like to reproduce like, gives rise to various organic changes, still our researches are at present uninstructive as to why like should produce like, why acquired characteristics in the parent should be reproduced in the offspring. Reproduction itself is still an enigma, and this great question may involve deeper thoughts than it would be suitable to enter upon now.

Perhaps the most convincing argument in favour of continuity which could be presented to a doubting mind would be the difficulty it would feel in representing to itself any *per saltum* act of nature. Who would not be astonished at beholding an oak tree spring up in a day, and not from seed or shoot? We are forced by experience, though often unconsciously, to believe in continuity as to all effects now taking place; if any one of them be anomalous we endeavour, by tracing its history and concomitant circumstances, to find its cause, *i.e.*, to relate it to antecedent phenomena; are we then to reject similar inquiries as to the past? is it laudable to seek an explanation of present changes by observation, experiment, and analogy, and yet reprehensible to apply the same mode of investigation to the past history of the earth and of the organic remains embalmed in it?

If it be true that continuity pervades all physical phenomena, the doctrine applied by Cuvier to the relations of the different parts of an animal to each other might be capable of great extension. All the phenomena of inorganic and organized matter might be expected to be so inter-related that the study of an isolated phenomenon would lead to a knowledge of numerous other phenomena with which it is connected. As the antiquary deduces from a monolith the tools, the arts, the habits, and epoch of those by whom it is wrought, so the student of science may deduce from a spark of electricity or a ray of light the source whence it is generated; and by similar processes of reasoning other phenomena hitherto unknown may be deduced from their probable relation with the known. But, as with heat, light, magnetism, and electricity, though we may study the phenomena to which these names have been given, and their mutual relations, we know nothing of what they are; so, whether we adopt the view of natural selection, of effort, of plasticity, &c., we know not why organisms should have this *nisus formativus*, or why the acquired habit or exceptional quality of the individual should reappear in the offspring.

But the doctrine of continuity is not solely applicable to physical inquiries. The same modes of thought which lead us to see continuity in the field of the microscope as in the universe, in infinity downwards as in infinity upwards, will lead us to see it in the history of our own race; the revolutionary ideas of the so-called natural rights of man, and *à priori* reasoning from what are termed first principles, are far more unsound and give us far less ground for improvement of the race than the study of the gradual progressive changes arising from changed circumstances, changed wants, changed habits. Our language, our social institutions, our laws, the constitution of which we are proud, are the growth of time, the product of slow adaptations, resulting from continuous struggles. Happily in this country, though our philosophical writers do not always recognize it, practical experience has taught us to improve rather than to remodel; we follow the law of nature and avoid cataclysms.

The superiority of man over other animals inhabiting this planet, of civilised over savage man, and of the more civilised over the less civilised, is proportioned to the extent which his thought can grasp of the past and of the future. His memory reaches further back, his capability of prediction reaches further forward in proportion as his knowledge increases. He has not only personal memory which bring to his mind at will the events of his individual life. He has history, the memory

of the race; he has geology, the history of the planet; he has astronomy, the geology of other worlds. Whence does the conviction to which I have alluded, that each material form bears in itself the records of its past history, arise? Is it not from the belief in continuity? Does not the worn hollow on the rock record the action of the tide, its stratified layers the slow deposition by which it was formed, the organic remains embedded in it the beings living at the times these layers were deposited, so that from a fragment of stone we can get the history of a period myriads of years ago? From a fragment of bronze we may get the history of our race at a period antecedent to tradition. As science advances our power of reading this history improves and is extended. Saturn's ring may help us to a knowledge of how our solar system developed itself, for it as surely contains that history as the rock contains the record of its own formation.

By this patient investigation how much have we already learned, which the most civilised of ancient human races ignored! While in ethics, in politics, in poetry, in sculpture, in painting, we have scarcely, if at all, advanced beyond the highest intellects of ancient Greece or Italy, how great are the steps we have made in physical science and its applications.

But how much more may we not expect to know? We, this evening assembled, ephemera as we are, have learned by transmitted labour to weigh, as in a balance, other worlds larger and heavier than our own, to know the length of their days and years, to measure their enormous distance from us and from each other, to detect and accurately ascertain the influence they have on the movements of our world and on each other, and to discover the substances of which they are composed; may we not fairly hope that similar methods of research to those which have taught us so much may give our race further information, until problems relating not only to remote worlds, but possibly to organic and sentient beings which may inhabit them, problems which it might now seem wildly visionary to enunciate, may be solved by progressive improvements in the modes of applying observation and experiment, induction and deduction.

SPECIAL MIDDLE-CLASS EDUCATION IN FRANCE.

The Minister of Public Instruction and other authorities in France are using all their endeavours at the present moment to afford means of sound special education to the youth of the middle-classes. The thorough education of the industrial, commercial, and agricultural classes is an object upon which no amount of real study and time can be misapplied; it is the cultivation of the very heart of a nation. Besides its general importance, it has a special meaning in France, where the system of gratuitous or semi-gratuitous education of the first-class has rendered the aspirants for the liberal professions and sciences so unusually numerous, in fact, so out of proportion to other matters. The object of the improvements now being carried out, or which are under consideration, is to develope all the intellectual faculties, to give to the manual employments their due importance, and to arrest the undue tendency referred to above; in short, to counterbalance the effect of vanity, which pushes so many young men towards the so-called liberal professions, in which so few succeed, by pointing out the value of other occupations, and showing how they may raise both themselves and their professions by the careful study of the principles which underlie them, and of the practices by which they are carried out. In the secondary special schools, geometry, commercial geography, the applied sciences, French literature, foreign languages, and not classics, will form the main objects of study, while Latin will merely have place as an auxiliary. Those pupils who exhibit not only a desire but a real aptitude for higher, or what are commonly regarded as higher, studies, may be transferred to the other schools or colleges, but the main object in view is to give something more than average education to average talents.

Special model schools are to be established in several parts of the country to serve at once as nurseries and types with the best possible teachers, collections of instruments of precision, laboratories and extensive libraries. One of these special schools or colleges will be attached to the new normal school for special education, which has been more than once referred to in this *Journal*, and which is to open its doors in October in the present year. In addition to this the east of France will have another college of the same class—the professional school of Mulhouse—which is about to be remodelled on the plan laid down in the new scheme of secondary special education.

At the other extremity of France, at Mont de Marsan, a new *lycée*, which also opens in October, is to become the model school for special instruction in the southwestern districts; and it is said that the maire of a manufacturing town in the neighbourhood of the Rhone has subscribed, anonymously, the sum of 15,000 francs for the transformation of a classical college into a special school of instruction.

The principles which will regulate these and other schools of the same class to be established will of course be common to all, but their application will not be uniform, the courses of study being modified according to the nature of the industry of the neighbourhood; thus, while in one district the new school will become a secondary school of mines, in another it will be principally an agricultural, and in a third chiefly a manufacturing college; though in all probability the special studies will be mixed, only one element will generally predominate in each.

The too great pressure of young men towards the liberal professions is easily accounted for in France, not only by the facilities offered by the government, but also by the comparatively small importance formerly attached by the educated portion of the French people to industrial pursuits; but the great progress which has been made of late years in manufacturing and commercial matters has not only created a necessity for superior special education, but has raised material employments greatly in the opinion of the public.

But in spite of the greater popularity of the liberal professions and fine arts above alluded to, it should not be unknown or forgotten by those who are aware of the fact, that the old special schools and colleges of France have done much for sound scientific training, and that no country possesses a higher educated class of mining engineers, manufacturers, chemists, and others. The Polytechnic School and the School of Mines have furnished hundreds of brilliant examples of men who combine classical acquirements with sound scientific knowledge and accomplished manners; and if the new schools should do as much in proportion for the classes possessing smaller means, we may see in a few years much of the redundancy of the ranks of art spread over and fertilizing the more directly necessary and equally honourable fields of agriculture and industry.

Movements such as these may well excite other nations to emulation, and they deserve and obtain the admiration of all well-toned minds, while, if any feel a spark of envy, they must be assured that the only means of competition are to be found in adopting similar principles modified in their application according to the occupations and the circumstances of each country, and the peculiar characteristics of its people. We have done a good deal of late for ourselves in the way of middle-class and special education, but it would be folly to shut our eyes and ears to the evidence which proves how much more remains yet to be done.

Fine Arts.

ARCHITECTURAL COMPETITION.—The authorities of the usy little town of Charleroi, in Belgium, invite foreign s well as Belgian architects to submit plans for the enargement of the town, the demolition of its fortifications, nd the reconstruction of its railway station. The first rize is of the value of £200, but it is not stated whether he recipient will be entrusted to carry out his design; he next best design to be rewarded with the sum of £80. The prize plans to remain the property of the municipality, which, moreover, reserves to itself the right of urchasing any of the others for the sum of £20.

LOCAL FINE ART EXHIBITIONS IN FRANCE.—The number and importance of provincial exhibitions increase very day. That of Lille is now open, and contains more han fifteen hundred works, of which twelve hundred are il paintings. Orleans has just had its first exhibition, nd the result must be considered as highly encouraging or artists; out of about one hundred and fifty works ent from Paris for Exhibition twenty-five were sold, all ut three being oil paintings. The Rouen exhibition, ne of the most important of all the provincial exhibitions, announced to open on the 25th of September. The st of prizes includes a gold medal of the value of £40, nd four small gold medals, and the municipal authorities, he Society of the Friends of Art, and many private ndividuals buy largely. The exhibition remains open or two months. An exhibition is now open at Grenoble, he first that has been held in that town for nine years, nd includes four or five hundred works of art.

STATUES IN COPPER REPOUSSE.—The execution of tatues in beaten copper, like that exhibited outside the entral door of the Universal Exhibition of 1862, in the romwell-road, and the admirable colossal statue of Vercingétorix, by M. Aimé Millet, set up in the native own of the famous Gallic chieftain, seems likely to btain the extension it deserves; the municipal council f Marseilles has opened a competition for a statue of he Virgin, to be executed in this manner, for the new hurch of Notre Dame de la Garde. Three eminent culptors have signified their intention of competing. For heroic and colossal statues and groups, and, consequently, for public monuments to be erected out of doors, his mode of execution is admirably adapted, as enabling he artist to produce great boldness with a very small mount of metal, and with little weight, and it is difficult o conceive a more imposing memorial than a statue, with a hill for its basis, which may be seen for miles round. Colossal modelling has, moreover, this advantage, that it demands the greatest possible attention, not nly to proportion, but also to effects, and thus leads to bold, broad style, that is equally important, not only s regards single statues and groups, but in architectural orks.

Manufactures.

STEAM-BOILERS.—The Engineer to the Manchester Association, in his report for July, draws special attenon to some of the defects and imperfections that have een discovered in the examination of various boilers nder inspection by the Association:—With regard to nternal corrosion, some corrosive waters not only waste nd indent the surface of boilers internally, but also estroy the vitality of the metal, so that the edge of the verlap may be cut away with a few slight blows with he hammer, and the rivet heads knocked off with a and chisel only, and easily pulverised. Such was the haracter of the defects found in one of the boilers xamined during the past month, and which was at once aid off by the owners, and condemned as soon as its ondition was pointed out. The above shows the importance of carefully testing corroded rivet heads with a hammer. With regard to external corrosion, two dangerous cases arose from leakage at the joints of boiler mountings, in consequence of their being bolted to the shell instead of rivetted. The plates were so eaten away that in one case the inspector scraped a hole through with his chisel, while this could easily have been repeated in the other. One of the mountings was a cast-iron manhole mouthpiece of somewhat large size, and as the corrosion extended in a groove all round it the boiler was clearly unsafe to be worked, and was immediately laid off. This encircling groove was not very easy of detection, since, although nearly eating through the plate, it was only three-eighths to half an inch wide, and almost buried under the edge of the casting; added to which it was filled up with tar with which the boiler had been coated. All mountings, instead of being bolted to boilers, should be attached with suitable fitting blocks rivetted to the shell. In reference to deficiency of water, this arose at night-time, when the fires were banked up, from the attendant's omitting to close the feed-stop valve, there being no self-acting back-pressure valve, and the feed inlet being below the furnace crowns. The importance of every boiler being fitted with a good self-acting feed back-pressure valve, as well as of the feed inlet being above the level of the furnace crowns, has been frequently pointed out in previous reports. The furnace crown was fitted with one of those fusible plugs in which the alloy is in the shape of a washer about the size of a pennypiece, having a copper button in the centre of it. This did not, however, prevent the plates becoming red hot. The plug did not put out the fire, or, properly speaking, go off at all. A little piece of the alloy melted away on one side and allowed a slight escape of steam, which fortunately attracted the attention of a workman, who at once examined the boiler and found the furnace crown red hot.

Commerce.

A NEW INDUSTRY FOR IRELAND.—The following is from *The Grocer*:—Beet sugar, which would in Ireland yield a larger return to the grower than flax, is the new branch of industry to which we desire to draw attention. We are prompted in that desire by two circumstances—one, the publication a few months since of a very able pamphlet by Mr. A. Baruchson, of Liverpool, upon the "History and Progress of the Manufacture of Beetroot Sugar;" and the other the recent completion of a very extensive sugar refinery in Dublin, the first and only refinery that Ireland can boast of. The Messrs. Bewley and Company have not only set an example which should stimulate their countrymen to enterprise, both in this and other branches of trade, but have partially provided the very means by which a crop of beetroot, easily cultivated, may be rendered extremely profitable to speculators. It is even stated that a beet crop in Ireland would yield on the average nearly half as much more per acre as in France, the soil and climate being more favourable for the growth of beet, while improvements in agriculture, united to British capital, would increase the production still more.

BEET SUGAR IN THE UNITED STATES.—We learn from New Orleans (say Messrs. Travers) that the first load of seeds of white Silesian beetroot, amounting to about six tons, has just been imported into America from France, with a view to its being sown in Illinois; and from the crop which is to be raised from this seed it is expected sugar will be made during the present year. The consequences of this movement it is impossible to foresee, but there can be no doubt that, if it be successful, it will greatly affect the cultivation of the cane sugar in Louisiana. The introduction of the beet into the United States is naturally looked upon with uneasiness by the planters in Louisiana, who will doubtless take steps to resist the inroad likely to be made upon their

special branch of cultivation by this formidable rival. "In view of the efforts made," says the *Renaissance Louisianaise*, "to deprive Louisiana of its sugar market, it is high time that our sugar manufacturers should take into consideration the whole question of the sugar industry, and oppose an organized resistance to the new movement." In the present age of free-trade, the best, and indeed the only permanent way of successfully combating with the beet sugar, is—not by any protective system—but by improving the quality of the cane sugar, and by the judicious employment of all the most recent inventions to bring the cost of manufacture down to the lowest point consistent with a fair return for labour and capital. At the same time it by no means follows that the success of the beetroot implies the relinquishment of the cane sugar cultivation, or *vice versâ;* with the increasing populations and increasing demand there is ample room, we contend, for the development of both, and we await with interest the renewed efforts that will doubtless be made by the advocates of both, and the ultimate effects of these efforts on the condition and prospects of the American sugar trade.

Sherry Wine.—A very large portion of the wine exported from Cadiz is sent to London and other ports in Britain. This is far the largest shipment. The other destinations coming next in importance are New York, Russia, and Hamburg. Various grades of sherry are shipped at prices ranging from £10 to £200 sterling per butt, and these wines may be enumerated under four classes, viz:—1. Low and spurious compounds, at from £10 to £20 per butt (say) one-fifth of the whole. 2. Common, ordinary, and middling sherry, from £25 to £45 per butt (say) two-fifths. 3. Good sherry, from £45 to £70 per butt (say) three-tenths. 4. Superior sherry, from £70 to £200 per butt, one-tenth. The wine district between Port St. Mary's and Jères yields the better growths; and the low qualities are made up of Seville, Cordova, Moguèr, Lebrija, Tribujena, Chiclana, Chipiona, and San-Lucar wines, which are brought down to the two shipping towns, and made up under the general denomination of "sherry." During the past year large quantities of wines have been introduced into the district from Malaga and Alicante; but these wines have not proved serviceable or usable, their peculiar earthy and tarry character it being impossible to overcome; as, though mixed with other wines, in but small quantities, the unpleasant flavour and smell is always distinguishable to a judge of wine. The low spurious compounds adverted to are made up with molasses, German potato spirit, and water, to which some colouring matter, and a small quantity of wine are added, much in the same manner that the "Hamburg sherries" have been manufactured, to which of late the London customhouse has, very properly, refused admittance. Of course, no known respectable wine merchant would lend himself to ship such low and adulterated compounds; but that it is done, and, moreover, with the cognizance of the consignees in London, is well known; because such wines are usually sold by auction on their arrival at extraordinarily low prices; which, unless the "liquid stuff" in question were wonderfully cheaply procured, would leave to the shippers a heavy loss.

The Spanish Shipping Interest.—It appears, by a recent consular report, that the number of Spanish ships which entered Spanish ports between the years 1850 and 1862 was 4,216; the quantity of merchandise, 226,224 tons; and the number of seamen employed, 59,969. The number of foreign ships during the same period was 4,199, with cargoes to the amount of 943,873, and employing 40,961 seamen. The number of Spanish ships which cleared was 3,466, cargoes, 209,915, seamen, 45,012; and the number of foreign ships, 3,216; cargoes, 529,014; seamen, 34,697. It results, therefore, that though there were 267 more Spanish than foreign ships, they carried 1,036,748 tons of merchandise less, and required 29,053 seamen more. The Spanish ships measured 934,724 tons, and carried only 436,139 tons of cargo, thus showing a loss of space of 53·34 per cent., while this loss in the foreign ships was 0·46 per cent. The average amount of cargo carried by each Spanish ship was 56·92 tons, while the foreign ships averaged 196·64. Each Spanish ship employed one man for every four tons; each foreign ship one man for every seventeen tons. Unless there is a change in the system, it is clear that ere long the Spanish mercantile marine will be forced to content itself with the coasting trade. In almost every other country the greatest pains are taken to build as cheaply, and at the same time as commodiously, as possible. But in Spain it is otherwise. Means are adopted to enhance the cost of ship-building, and maritime regulations increase the cost of navigation. To counterbalance this, then, the Government have adopted the differential duty, and such appears to be the attachment to this species of protection, that although the produce of the northern provinces is oftentimes sent to Bordeaux for shipment in French bottoms, on account of the high rate of Spanish freights, still the fact that the national shipping is only bolstered up in this manner in order to enable it just to hold its own against the foreign, seems not to be recognised. The very idea of the abolition of this duty is alarming to the shipping interest; for, relying on its privileges to maintain its superiority, it has made no exertion to improve its material, and foresees with dread, if they should be withdrawn, the successful competition of the foreigner. The same system which in former times ruined the internal commerce of the country, is still at work to ruin its external commerce.

Colonies.

Trade of New Zealand.—The total imports of the colony for the year 1865 were £5,587,683, against £6,997,357 for 1864. The exports for 1865 were £3,724,691 against £3,457,909, showing a decrease in the imports of £1,409,674, but an increase in the exports of £316,782. There has been a falling of in the imports, both on the quarter and the year, as compared with the previous year, while there has been an undeniable increase in the value of exports. The item of £1,419,674 on the year's trading of 1865 shows a very considerable fluctuation of trade, and this great reduction is but poorly compensated for by the increase of exports, seeing it is entirely made up of gold. The value of gold exports on the December quarter was £993,444, as against £361,977 in the same period of 1864. It appears that, with a much larger production of gold, no stimulus has been given to business; on the contrary, business, if measured by the imports, has been curtailed. But this is not any proof of going back, as it is a well-known fact that there was a great deal of over-trading and speculation in 1863-4, and stocks were wisely reduced in the past year. On the whole these returns are considered satisfactory.

Emigration.—It appears, by the report of the Emigration Commissioners, that in the 51 years that have elapsed since 1814 there have left the United Kingdom 5,901,501 emigrants, of whom 3,597,789, or nearly 61 per cent., have gone to the United States, 2,177,850 to British colonies, and 125,871 to other places. The emigration during the year 1865 was 209,801, of whom there were 61,345 English, 12,870 Scotch, and 100,676 Irish. In the first three months of the present year 39,672 persons left the United Kingdom, of whom 32,913 went to the United States.

The Alpaca and Llama.—It appears by a Sydney paper that the Government have determined to sell the flocks of alpacas and llamas, which cost several years ago £15,000. Last year the flock was considerably larger than it is at present. The animals have suffered much from drought. The flock now consists of about 190 alpacas, llamas, and hybrids, all of which were

represented to be in a strong and healthy condition. It was anticipated that some of the Colonial Governments would compete for the animals, or a part of them; the sale has, therefore, been fixed for a distant period.

COCHINEAL.—A Melbourne paper says:—Some cochineal insects with their larvæ have been received by Dr. Mueller from Sir George Grey, Governor of New Zealand, and it is intended to attempt their propagation here upon suitable cactus plants as an experiment.

Obituary.

MR. ROBERT TEMPLE, Master of the Supreme Court at Mauritius, died on Friday, the 6th July, after a short but painful illness, borne with the utmost fortitude and resignation. He was 65 years old at the time of his decease, and had held the above-named appointment at Mauritius three years and two months. He had been previously, and for 18 years, Chief-Justice of British Honduras, where he did much to call attention to and develop the industrial and commercial resources of the colony. He was elected a member of the Society of Arts in 1855, but even previously to that time, while in Honduras, forwarded numerous interesting and valuable contributions to the *Journal* upon the resources of that colony.* On his return to England he was a frequent visitor at the house of the Society, and evidently took much pleasure in attending its meetings. The paper read by him in January, 1857,† on the "History, Trade, and Natural Resources of Honduras," was especially able and exhaustive, and excited much attention among all interested in colonial questions. After leaving Honduras, and while in England, he acted as secretary to the Commission on Metalliferous Mines, appointed by the Government, and of which Lord Kinnaird was the Chairman. A Mauritius journal, after expressing regret for his loss, says that it would be generally "acknowledged that during his term of office nothing could exceed the patience and good humour of his demeanour, while all must be satisfied of the strict impartiality and perfect integrity which actuated him in the fulfilment of his official duties. In his private circle of relations and friends the late Robert Temple will be sadly missed and deservedly regretted. His temperament was a most joyous one; witty, full of anecdote, endowed with a world of general information, his conversation was listened to with admiring pleasure, while the suavity of his manners, and, above all, the frequent indications of the kind heart which beat in his breast, endeared him to every one who had the advantage of his acquaintance." These favourable sentiments will certainly be echoed by his numerous friends in England.

Notes.

MUSIC.—The *Saturday Review* says:—"Music is one of the highest educational influences that a nation can undergo, and an influence, moreover, that probably no nation so much needs as our own."

THE EDUCATION COMMITTEE.—The Select Committee appointed to inquire into the constitution of the Committee of Council on Education, and the system under which the business of the office is conducted, and also into the best mode of extending the benefits of Government inspection and the Parliamentary grants to schools at present unassisted by the state, have reported that, in consequence of the change of administration, they have not been able to ascertain the views of the present Government on the main points to be considered, and have therefore determined not to enter upon the discussion of the important draught report presented to them by their chairman; but have resolved to lay the evidence alone upon the table of the House, leaving it for the House to determine whether they shall be re-appointed next year, in order to prepare a report thereon. The report proposed by the chairman, Sir John Pakington, contained the following recommendations:—"1. That the Committee of Council on Education, as being no longer adapted to the purpose for which it was formed, should cease to exist. 2. That there should be a Minister of Public Instruction, with a seat in the Cabinet, who should be intrusted with the care and superintendence of all matters relating to the national encouragement of science and art and popular education in every part of the country. 3. That although they cannot endanger the supply of competent teachers by proposing abandonment of the teacher's certificate as a condition of assistance to the school, such a modification of that condition should be adopted as would prevent it from being, as it now is, an impediment to the extension of education. 4. The establishment of local organisation in connection with the Education Department, so as to put an end to the present injurious centralization, and enable the superintendence of education to be conducted in a manner similar to that in which the Poor-law is administered by Boards of Guardians under the guidance and control of the Poor-law Board. 5. That power should be given to levy a rate for the promotion of education in certain cases, to be defined. 6. That to meet the difficulty caused by the small area and population of many parishes, small schools should be combined under a good circulating master, or small parishes combined with a good central school, as the circumstances of the locality might render most expedient. 7. That the numerous educational endowments, now almost useless, should be reformed, and made available. 8. That the difficulty caused by religious difference should be met by the compulsory adoption of the 'Conscience Clause' in every trust deed, the Education Minister being empowered to suspend the annual grant to any school on proof of exclusion or undue constraint of Nonconformists on religious grounds. 9. That the impediments to education in Wales, arising from the state of religious opinion in that country, should be met by the adoption, in a liberal spirit, of some plan similar to those suggested in the evidence and in this report."

INSTANTANEOUS PHOTOGRAPHY BY ARTIFICIAL LIGHT.—Some experiments have been recently made by Mr. Skaife in taking photographs by artificial light instantaneously. A plate, carefully prepared, is put into a camera; the sitter, in a partially dark room, engages in conversation with any one, so as to secure a natural play of expression; a little powder on the pan of a lamp of peculiar construction is set off in a puff, like the flash of a charge of gunpowder, and thus an instantaneous picture is taken. The powder is composed of certain parts of pulverised magnesium and chlorate of potash, and is set on fire by being heated by a spirit lamp under the pan, which has a hole in it, and the light is brought into contact with the dry powder when the pan is slightly shaken by means of a wire. The pan having a reflector at the back, the light is thrown full on the sitter, and the negative is said to be obtained in about the fiftieth part of a second.

MONTE CASSINO.—A parliamentary paper has been issued, containing correspondence with the Italian Government respecting the suppression of ecclesiastical corporations in Italy. The interest which the learned in this country have taken in the preservation of the great Benedictine house of Monte Cassino is well known. Addresses on the subject were forwarded to Her Majesty's Government from the President of the Society of Antiquaries and from the Archæological Institute of Great Britain and Ireland, appealing to them to use their influence with the Italian Government for the ex-

* See *Journal*, vols. II., pp. 500, 748; III., pp. 159, 547, 646, 714, 783; IV., pp. 104, 205, 333, 379, 535, 699, 738, 760; V., p. 597; VI., pp. 465, 484; VII., pp. 24, 623, &c.

† See *Journal*, vol V., p. 113.

emption of the Benedictine Monastery of Monte Cassino from the operation of the law which has passed the Chamber of Deputies for the suppression of the monastic institutions. Our representative at Florence having communicated these addresses to the Italian Government, stating at the same time that the British Government sympathizes in the appeal, a reply has been received from the Government of Italy to the effect that although the existing law on the subject cannot be materially modified, there is an article in that law which "has provided for the preservation of the above-named monastery as an artistic monument, and the King's government will not fail to avail itself of the discretion which is left to it to preserve from all injury the monuments contained in the Abbey of Monte Cassino. Thus the desire of Her Majesty's Government will be satisfied by the Italian Government as far as can be done consistently with the dispositions of the law which the Government is called upon to execute." The article referred to is as follows:—"The Government will be careful to preserve the edifices, with their appurtenances, libraries, archives, objects of art, scientific instruments, and the like, belonging to the Abbeys of Monte Cassino, the Cava dei Tirreni, San Martino della Scala, Monreale, the Carthusians near Pavia, and other similar ecclesiastical establishments distinguished by their monumental importance, and by the possession of literary and artistic treasures. The expense of keeping them up will be at the charge of the ecclesiastical fund."

Correspondence.

Paris Exhibition of 1867.—Heating and Lighting.—Sir,—By a miscopy or a misprint, a supercilious affront is conveyed in my letter inserted in the *Journal* of last week, on the testing of heating and lighting apparatus for the International Exhibition, in which letter the expression, "little-*heeded* traders' pretensions," is changed into "little-*headed* traders' pretensions." The object of the proposed competition for space by well devised qualities (instead of mere forms), tested by competent and impartial authorities, is to ensure that real merit shall be duly heeded by the public. As the Imperial Commissioners have been pleased to approve of the suggestion, and have determined to make provision for carrying it out practically, I hope that British manufacturers will respond to the invitation which will be authoritatively given to them. I may state that a committee has been appointed by Her Majesty's Commissioners, comprising British engineer officers, to direct the testing of cooking and warming appliances for the British army, with naval officers, to superintend the trials of cooking and other apparatus for the British navy, and other members have been appointed, specially with the view of judging of the trials that may be made of appliances for domestic and other civil purposes. I would submit to the consideration of the Council of the Society of Arts whether they might not aid the object, by offering prizes for the best cottage ranges, and others which are not the highest in commercial profit and promise of manufacturing attention. I believe that the principle of a competitive examination to test the qualities of objects, for which space is to be allotted in the Exhibition, may be advantageously applied to other classes of subjects. Two other classes, which have been brought under my particular observation, I have submitted for consideration. Such previous carefully-conducted examinations will, I believe, greatly facilitate and improve the service of jurors—a service which, in my experience as a juror in France and in England, at International Exhibitions, it has hitherto been commonly very difficult to render satisfactorily towards the public as well as towards exhibitors.—I am, &c., Edwin Chadwick.

Richmond, Surrey, S.W., August 20th, 1866.

Patents.

From Commissioners of Patents' Journal, August 17th.

Grants of Provisional Protection.

Anti-acid oil—1633—W. B. Brown.
Card cloth—1826—J. Moseley.
Cutlery handles—1742—F. Kahut and J. Bunting.
Dress, fastenings for—1860—E. Drucker.
Fibrous substances, preparing, &c.—1850—L. J. Crossley and J. Sunderland.
Fibrous substances, spinning, &c.—1862—T. Westley and T. R. Beaumont.
Fire arms, breech-loading—1828—K. H. Cornish.
Fluids, forcing—1788—E. H. Aydon and E. Field.
Folding chairs—1836—A. V. Newton.
Fruit, dressing—1856—R. Soans.
Furnaces—1813—G. W. Hawksley, H. Wild, and J. Astbury.
Gas burners—1866—W. E. Gedge.
Gas retorts—1854—A. R. Stark and J. Woodman.
Grease cups—1832—W. Clark.
Guns, preventing the fouling of—1852—W. Ager.
Horses' nosebags—1818—F. Degravel.
Lamps—1872—J. Moffat.
Liquids, cooling—1834—M. J. Roberts.
Locomotive engines—1830—J. Ward and J. Smales.
Maps, rollers for—1893—W. S. Davis.
Motive power—1822—R. W. Fraser.
Motive power engines—1848—W. Justice.
Oxalic acid—1969—F. C. Hills.
Pneumatic railways—1844—T. W. Rammell.
Sewage, separating the fluid and solid parts of—1820—C. E. Austin.
Sewing and button hole machines—1876—F. Tolhausen.
Sewing machinery—1874—N. Salamon.
Shale, &c., decolorising the products obtained in distilling—15[illegible]—J. Law.
Silk waste, treating—1727—S. C. Lister.
Soda and potash, sulphates of—1917—G. Davies.
Steam engines—1824—W. Naylor.
Steam slide valves—1939—W. E. Kochs.
Steam travelling cranes—1842—R. Roger.
Timber, preserving—1846—A. Prince.
Travelling bags—1858—E. Heusser.
Velocipedes—1981—E. Gilman.
Walking sticks, &c., tipping with glass—1961—J. J. Wheeler.
Wrought iron—1868—G. Plant.
Yarn, spinning—1864—A. V. Newton.
Yarns, winding, &c.—1911—T. Andrews.

Patents Sealed.

517. J. Nall.	548. J. Walker.
520. T. Kennedy.	559. W. Tongue.
522. G. and D. Hill.	631. W. R. Lake.
524. J. A. Warwick.	637. J. Carpenter.
530. H. S. Swift.	680. W. R. Lake.
538. W. Webb.	872. A. V. Newton.
539. H. S. Swift.	880. W. T. Eley.
543. N. R. Hall.	1540. C. McFarland.
546. M.&J.Robinson &W. Smith.	1662. J. Holloway.

From Commissioners of Patents' Journal, August 21st.

Patents Sealed.

545. J. D. Brunton.	603. H. Robertson.
562. J. Dodge.	609. J. Hick.
573. J. I. Barber.	613. J. Norman and J. Copeland.
574. T. Bulley.	625. J. Young.
576. T. Spencer.	732. G. Phillips.
577. J. Petrie, jun.	1199. J. L. Davies.
579. F. C. and C. E. Wimby.	1327. J. A. Jones.
581. P. H. Lealand.	1452. T. Greenwood.
582. I. L. Pulvermacher.	1609. S. Kilby and G. Dixon.
588. F. M. Jennings.	1684. W. Welbourne.
594. W. E. Gedge.	

Patents on which the Stamp Duty of £50 has been Paid.

2020. P. F. L. B. Him.	2045. J. Arthur.
2066. C. G. Wilson.	2056. A. Cruickshank.
2008. C. Schiele.	2071. J. Platt and W. Richardson.
2026. E. Lord.	2078. R. A. Brooman.
2051. J. Yates.	2080. R. Griffiths.
2055. C. H. McCormick.	

Patents on which the Stamp Duty of £100 has been Paid.

1958. E. Rettig.	D. Greig, jun., R. E. Allen, and W. Worby.
1936. T. Briggs.	1991. J. Chatterton.
1908. J. Fowler, jun., R. Burton,	

Journal of the Society of Arts.

FRIDAY, AUGUST 31, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Proceedings of Institutions.

STOCKTON MECHANICS' INSTITUTE OF LITERATURE AND SCIENCE.—The Report for the year 1865 speaks of a diminution of members during the year, the number on the books being—First-class members, 35; second-class, 110; third-class, 55; fourth-class, 95; total, 295; showing a diminution of 43 as compared with the close of 1864, and although this falling off may in some measure be accounted for by the opening of other Institutes in the town, yet the Committee feel that the increasing population of the town ought to furnish new members to fill the places of such as withdraw. The circulation of books and periodicals has been 3,665, showing an increase as compared with last year. The classes have been arranged on the same plan which has proved successful in previous years. The classes conducted by Mr. Walker for the study of arithmetic, algebra, Euclid, geography, grammar, and writing, met five nights in the week:—Number of students entered, 35; average attendance—youths' class, 13; senior class, 6. Mr. Kelly's class for the study of freehand and mechanical drawing met once a-week; average attendance, 17. Fourteen students of Mr. Walker's class were examined by the West Riding Educational Board, out of which number six obtained certificates of merit. The £5 placed at the disposal of the Committee by Mr. Dodds, for the encouragement of the classes, has been equally divided amongst the six successful candidates, and expended in books of their own selection. Three Saturday evening entertainments were given, which were well attended. The working of the Penny Savings Bank has been very satisfactory, the deposits having amounted to £755 10s. 4d., and the withdrawals to £526 5s. 3d. The Committee have used their best exertions to maintain the high character of the news and reading room, but they have not felt justified in making additions to the library. In order to meet the wishes of a considerable portion of the members, a billiard room has been established. The members of the billiard club must be first or second class members of the Institute, and pay in addition a subscription of 10s. 6d. per year. The amount required for the purchase of the billiard table was raised by the members of the club in shares. The present number of members of the club is 45, of whom 22 are new members of the Institute. The financial statement shows that the receipts have been £31 18s. 7d., and there is a balance due to the treasurer of £51 15s. 8d.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 638).

ENGLISH LITERATURE.

THREE HOURS ALLOWED FOR THE TWO AUTHORS SELECTED BY THE CANDIDATE.

CHAUCER.

(Prologue to the "Canterbury Tales.")

SECTION I.

1. Ful worthi was he in his lorde's werre,
And thereto hadde he riden, noman ferre,
As well in Christendom as in hethenesse,
And evere honoured for his worthinesse.
At Alisandre he was whan it was wonne,
Ful ofte time he hadde the bord bygonne,
Aboven alle nacions in Pruce.
In Lettowe hadde reyced and in Ruce,
No christen man so oft of his degre.
In Gernade atte siege hadde he be
Of Algesir, and riden in Belmarie.
At Lieys was he, and at Satalie,
When they were wonne; and in the Greete see
At many a noble arive hadde he be.
At mortal batailles had he been fitene,
And foughten for our feith at Tramassene
In lystes thries and aye slayn his foo.

(*a.*) Write out the sense of this passage in modern English prose, keeping as closely as you well can to the original.

(*b.*) Explain the allusions.

(*c.*) Give a list of all the words which must be pronounced or accented differently from modern usage in order to preserve the versification.

2. Explain the following words:—*altherbest, lazar, vernicle, forby, thestat, tharray, tailles, solempne, ywrought, forpyned, ypiked, swinke.*

3. Explain these passages:—

Wel cowde he fortune the ascendent
Of his images for his pacient.

He rood upon a rouncy, as he couthe,
In a gowne of faldying to the kne,
A dagger hangyng on a laas hadde he.

In alle the orders foure is noon that can
So moche of daliaunce and fair langage.

4. Mention some of the grammatical constructions frequently used by Chaucer which have become obsolete.

SECTION II.

5. Describe either the Prioress, or the Clerk of Oxenford, as nearly as you can in the words of Chaucer.

6. What do you know of the shrine of Becket?

7. Give a short account of the pilgrimage to Canterbury as described by Chaucer.

8. Briefly sketch the life of Chaucer, and notice some of his most distinguished contemporaries.

SHAKSPEARE.

("King Lear"—"Richard III."—"As you like it.")

SECTION I.

(*a.*) Tut, I can counterfeit the deep tragedian;
Speak, and look back, and pry on every side,
Tremble and start at wagging of a straw,
Intending deep suspicion: ghastly looks
Are at my service, like enforced smiles;
And both are ready in their offices,
At any time, to grace my stratagems.

(*b.*) You touched my vein at first; the thorny point
Of bare distress hath ta'en from me the show
Of smooth civility: yet I am inland bred,
And know some nurture.

(*c.*) Jocky of Norfolk, be not so bold,
For Dickon thy master is bought and sold.

(*d.*) O reason not the deed: our basest beggars
Are in the poorest things superfluous.

(*e.*) That Julius Cæsar was a famous man:
With what his valour did enrich his wit,
His wit set down to make his valour live:
Death makes no conquest of this conqueror;
For now he lives in fame, though not in life.

(*f.*) When others are more wicked, not being the worst
Stands in some rank of praise.

(*g.*) Why, 'tis a boisterous and a cruel style,
A style for challengers; why, she defies me,
Like Turk to Christian.

(*h.*) Mine enemy's dog,
Though he had bit me, should have stood that night
Against the fire.

1. In what connexion does each of these passages occur?

2. Notice every peculiar grammatical construction, and every word employed in an unusual sense.

3. Give such explanatory notes, referring to the subject matter, as may seem to be required.

Section II.

4. Sketch the character either of King Lear or of Jaques.

5. Compare the characters of Buckingham and King Richard III.

6. Give an account of the plot of the first act of Richard III.

7. What do you know of the sources to which Shakspeare appears to have been indebted in constructing the plots of these three plays?

8. Give some account of the early editions of Shakspeare's plays.

Bacon.

(The Essays.)

1. Give an outline of the essay, "Of Unity in Religion," or of that "Of Envy."

2. Explain the following passages, noticing anything peculiar in the words or grammatical construction:—

(*a.*) An ant is a wise creature for itselfe; but it is a shrewd thing, in an orchard, or garden.

(*b.*) Nay you shall see a bold fellow, many times, doe Mahomet's miracle.

(*c.*) The part of Epimetheus might well become Prometheus in the case of discontentments.

(*d.*) Virtue was never so beholden to human nature as it received its due at the second hand.

3. In what sense does Bacon use the following words:—*arietation, galliard, habilitation, monoculos, commodities, colour, fallaxes, propriety, quidditie, privado, success, mew.*

4. Explain this passage, and illustrate it by examples:—"Some books are to be tasted, others to be swallowed, and some few to be chewed and digested."

5. Explain this passage, and give a sketch of the argument which Bacon founds upon it:—"Men's thoughts are much according to their inclination: their discourse and speeches according to their learning and infused opinions; but their deeds are often as they have been accustomed."

Section II.

6. What does Bacon say respecting the first publication of the Essays in "The Epistle Dedicatorie?"

7. Give a short account of Bacon's life after he became Lord Chancellor.

8. What do you know of the Novum Organon?

Trench.

[On the Study of Words.]

1. What argument is drawn from the following passage:—"Whatsoever Adam called every living creature that was the name thereof," Gen. II., 19.

2. Words are said to be "the guardians of thought:" explain this and illustrate it by examples.

3. In what great particulars does the English language bear witness to the facts of our history?

4. Give examples of mistakes being embodied in names.

5. In what sense are names said to outlive things? Illustrate your answer by examples.

6. Explain these words:—*roué, mob, miscreant, talent, mammet, humanity, lumber, trivial, stipulation, cicerone, churl, surname.*

7. What is a synonym? Distinguish between *contrary* and *opposite*—*congratulate* and *felicitate*—*imagination* and *fancy*—*genuine* and *authentic*—*comprehend* and *apprehend*—*diffidence* and *despair*.

8. Explain the statement that there is poetry in words.

LOGIC AND MENTAL SCIENCE.

THREE HOURS ALLOWED.

Formal Logic.

1. What is the *Universal Principle of Reasoning?* How is it expressed by Aristotle? Explain and illustrate its meaning.

2. The conclusion of every syllogism is given in the premises. What argument has been founded against the utility of logic on this fact? How would you meet it?

3. What is meant by "*a term*" in logic? Many different *kinds* of terms have been enumerated by logicians; mention and explain the most important of these.

4. When are propositions said to be *opposed?* Explain the different kinds of opposition and give the rules of each?

6. What is meant by "*mood*," and what is meant by "*figure?*" For what kinds of arguments are the first, second, and third figures respectively best adapted, and why?

6. What general rules of the syllogism are violated in the following examples?—

Some literary men have been banished,
Some kings have been literary men,
Some kings have been banished.
Men are not feathered animals,
Eagles are not men,
Eagles are not feathered animals.
Many kings have been poets,
Many poets have been insane,
Some kings have been insane.

7. What is the classification of fallacies adopted by Whately? Explain the meaning of each class.

8. What is meant by the following terms employed to designate fallacies:—Homonymia, Amphibolia, Ignoratio elenchi, Petitio principii, Fallacia accidentis, Fallacia consequentis?

9. Analyse the following examples of reasoning and point out the *fallacies* contained in them:—

The French are a light-hearted people,
This man is a Frenchman,
Therefore he is light-hearted.
What I am you are not,
I am a man,
You are not a man.
All men are mortal,
Balbus is immortal,
Therefore Balbus is not a man.

Logic of Induction.

Mill's Logic.

1. Define induction.

2. Mention some operations said to be cases of induction which are not really so.

3. What axiom lies at the basis of all *pure* inductive reasoning?

4. What is the exact meaning which Mill attaches to the term "*Laws of Nature?*"

5. Give a brief sketch of Mill's analysis of the Law of Causation.

6. What is *observation*, and what is *experiment?* In hat respect is the latter superior to the former as an strument of research?

7. In determining a natural law, what is meant by the ethod of *agreement*, and what by the method of *differ-ce?* Which affords the strongest evidence, and why?

8. What is meant by the *explanation* of natural laws? ive instances from the history of physical science?

9. What are empirical laws, and of what value are ey in science?

Mental Philosophy.

Sir W. Hamilton's Lectures.

1. What is philosophy? How did it originate, and ider what conditions must it be pursued?

2. Explain Hamilton's doctrine of the "Relativity of man Knowledge."

3. What is expressed *generally* by the word conscious-ss? Is it one of the mental faculties?

4. Give Hamilton's classification of theories which ve been formed respecting our knowledge of the exter-l world.

5. Give Hamilton's classification of the *cognitive* facul-s, and show exactly what he intends to include under h head.

6. Show the distinction between sensation proper and ception proper, and their relation to each other.

. What is Hamilton's theory of perception, and to at other celebrated theory is it opposed?

. Explain the "law of the conditioned" as the great damental fact of man's regulative faculty, and point any of its applications.

Mental Philosophy.

Brown's Lectures.

. How does Brown show the fundamental unity of sical and mental science?

. Give some account of the physical processes in sation.

. What mental phenomena are usually ascribed to sense of touch? Give an outline of Brown's criticism this point.

. In what respect does Brown differ from Reid on the ject of *perception?* Give the principal points of his emic against the latter.

. Explain Brown's theory of *attention.*

. What are the *primary* and what the *secondary* laws uggestion? Enumerate them.

. Which of the faculties does Brown reduce to cases imple suggestion, and which to cases of relative sug-tion? Explain the method of this analysis.

. Make a table showing Brown's classification of ital phenomena.

Moral Philosophy.

Sir J Mackintosh.

. Into what two main inquiries may the whole of cal philosophy be divided? How have those two in-ies been confused?

. Name some of the ancient schools of morals with r leading tenets.

. Mention the most remarkable English writers who e advocated *utilitarianism*, and show in what *form* have advocated it.

. What different views have been held in England by cal writers on the nature of conscience?

. What are the leading ideas of Adam Smith's theory iodern sentiments?

. What great principle was introduced by Hartley the study of mental and moral philosophy? How he apply it to morals?

. How does Mackintosh attempt to mediate between osite systems of moral philosophy?

Moral Philosophy.

Fleming's Manual.

. Explain the difference between principles of know-ge and principles of action.

2. How may the primary principles of human action be classified? In what way may they be modified?

3. Explain the two main theories which have been held by ethical writers concerning the nature of conscience.

4. Mention the *special views* of some of our most celebrated moralists on this subject.

5. Explain the fundamental theories which have been held on the nature of virtue. What ethical doctrines are included under each?

6. What celebrated writers have advocated the principle of *benevolence* and the principle of *utility* respectively as the ground of morals.

7. Explain the theory of morals advocated by Dr. Fleming in his manual.

(To be continued.)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Nottingham, 1866.

The business of the Sections commenced on Thursday, the 23rd instant. The following is a list of the Papers read:—

THURSDAY, AUGUST 23rd.

Section A.—Mathematical and Physical Science.

J. Glaisher—Report on Luminous Meteors.

W. R. Birt—Report of Lunar Committee for Mapping Surface of Moon.

John Browning—On some Recent Improvements in Astronomical Telescopes with Silvered Glass Specula.

J. H. Gladstone and Rev. T. P. Dale—On Dispersion Equivalents.

J. Park Harrison—On the Heat Attained by the Moon under Solar Radiation.

Dr. T. L. Phipson—On Electro-negative Fogs.

Francis Galton—On an Error in the Usual Method of obtaining Meteorological Statistics of the Ocean.

Dr. Buys-Ballot—On the Method Adopted at Utrecht in Discussing Meteorological Observations.

Section B.—Chemical Science.

President's Address.

A. Matthiesen—Preliminary Report on the Chemical Nature of Cast Iron.

J. F. Walker—On a Phosphatic Deposit in the Lower Green Sand of Bedfordshire.

Walter Weldon—On a Proposed Use of Fluorine in the Manufacture of Soda.

John Attfield—On the Assay of Coal, &c., for Crude Paraffin Oil.

Stevenson Macadam—On the Poisonous Nature of Crude Paraffin Oil, and the Products of its Rectification upon Fish.

Section C.—Geology.

President's Address.

H. Hicks and J. W. Salter—Second Report on the Geology of St. David's, Pembrokeshire.

H. Woodward—Second Report on the Fossil Crustacea.

W. S. Mitchell—Report of the Committee Appointed to Investigate the Alum Bay Leaf-Bed.

J. Gwyn Jeffreys—Report on Dredging among the Hebrides, with regard to Geological Considerations.

Dr. Leith Adams—Second Report on the Maltese Caves.

Professor Hitchcock—On the Geological Distribution of Petroleum in North America.

W. Pengelly—On Raised Beaches.

Section D.—Biology.

Professor Newton—Report on the Extinct Birds of the Mascarene Islands.

J. Gwyn Jeffreys—Report on Dredging among the Hebrides.

H. B. Brady—Remarks on the Rhizopod Fauna of the Hebrides.

John Shaw—On the Distribution of Mosses in Great Britain and Ireland as affecting the Geography and Geological History of the present Flora.

P. L. Sclater—On the Systematic Position of the American Prong-horn (*Antilocapra Americana*).

William Turner—On a Remarkable Mode of Gestation in an Undescribed Species of Arius.

O. Groom-Napier—On Food and Economical Value of British Butterflies and Moths.

O. Groom-Napier—On the Causes of the Variation in the Eggs of British Birds.

Section D.—Department of Physiology.

Address by Professor Humphry.

Dr. John Davy—Is the Carbonate of Lime in the Egg Shells of Birds in a Crystalline or Amorphous State?

Dr. W. Sharp—On the Physiological Action of Medicines.

Dr. Cobbold—Remarks on the so-called Cattle Plague Entozoa.

Section D.—Department of Anthropology.

Address by Mr. Wallace.

C. Carter Blake—On a Supposed Human Jaw from the Belgian Bone Caves.

W. J. Black—On Colonies in South Africa.

Thomas Wilkinson—Notes on Madagascar.

Consul T. J. Hutchinson—The Indians of the Paraná.

John Collinson—The Indians of the Mosquito Territory.

Dr. R. S. Charnock—On the People of Andorra.

Section E.—Geography and Ethnology.

Sir Samuel W. Baker—On the Abyssinian Tributaries of the Nile.

Dr. Beke—On the Possibility of Diverting the Waters of the Nile into the Red Sea.

J. Crawfurd, Esq., F.R.S.—On Cæsar's Account of Britain and its Inhabitants.

Commander Lindsay Brine, R.N.—On the Eruption at Santorin, and its present condition.

Thomas Baines, Esq.—On the Probable Lower Course of the Limpopo.

Thomas Baines, Esq.—The Zambezi and its Westernmost Sources.

Section F.—Economic Science and Statistics.

The President's Opening Address.

Professor Leone Levi—On the State and Prospects of the Rate of Discount with Reference to the recent Monetary Crisis.

Free Trade in Banking in the Western States of America and Manchooria (Tartary), from Statements of W. Wells Brown, and T. T. Meadows, Her Majesty's Consul at Newchang.—Communicated by Colonel Sykes, M.P., F.R.S.

Frederick J. Wilson—On a National Bank, and Payment of the National Debt.

Section G.—Mechanical Science.

President's Address.

W. J. Macquorn Rankine, LL.D., F.R.S.—Report of the Committee "On the Resistance of Water to Floating and Immersed Bodies."

W. J. M. Rankine, LL.D., F.R.S.—Remarks on the Experiments of the foregoing Committee.

Frederick Ingle—On Recent Improvements in the Application of Concrete to Fireproof Construction.

W. E. Carrett—On an Hydraulic Coal-Cutting Machine.

FRIDAY, AUGUST 24th.

Section A.—Mathematical and Physical Science.

Fleeming Jenkin—Report of the Committee on Electrical Standards.

G. J. Stoney—On a Nomenclature for Multiples and Submultiples to render Absolute Standards Convenient in Practice, and on the Fundamental Unit of Mass.

William R. Grove—Letter from Professor Matteucci on Earth-Currents.

Balfour-Stewart—Extract of a Letter from Senhor Capello, of Lisbon, on Magnetic Disturbances.

William Hooper—On the Electrical and Mechanical Properties of Hooper's India-rubber, for Submarine Cables.

Professor Jellett—On a Fluid possessing the Power of Rotating the Plains of Polarization of Rays of the Opposite Ends of the Spectrum in Opposite Directions.

J. R. Hind—Remarks on the Recent Extraordinary Outburst of the Variable Star in Corona.

Francis Galton—Conversion of Wind Charts into Passage Charts.

Cornelius Varley—On Comets, and especially on the Comet of 1811.

Section B.—Chemical Science.

Dr. Daubeny—On Ozone.

T. L. Phipson—On an Extraordinary Iron-stone.

Peter Spence—On a New Process in the Manufacture of White Lead.

W. Crookes—On Disinfectants.

Dr. Crace Calvert—On the Oxidising Action of Carbon.

Section C.—Geology.

C. Spence Bate—An Attempt to Approximate the Date of the Flint Flakes of Devon and Cornwall.

Rev. P. B. Brodie—On the Correlation of the Lower Lias at Barrow-on-Soar, Leicestershire, with the Same Strata in Warwick, Worcester, and Gloucester shires; and on the Occurrence of the Remains of Insects at Barrow.

H. A. Nicholson—On Fossils from the Graptolite Shales of Dumfriesshire.

W. Pengelly—Second Report of the Committee for Exploring Kent's Cavern, Devonshire.

W. Topley—On the Physical Geography of E. Yorkshire.

A. B. Wynne—Notes on the Physical Features of the Land as Connected with Denudation.

Prof. Ansted—On Intermittent Discharges of Petroleum and Large Deposits of Bitumen in the Valley of Pescara, Italy.

Prof. Ansted—On a Salse or Mud Volcano on the flanks of Etna, commencing to erupt in the month of January last.

Section D.—Biology.

The President's Address.

Rev. F. W. Farrar—On the Teaching of Natural Science in Public Schools.

Clements R. Markham—Results of the Chinchona Cultivation in India.

Dr. Cobbold—On the Entozoa of the Dog in Relation to Public Health.

Section D.—Department of Physiology.

Dr. Ransom—On the Conditions of the Protoplasmic Movements in the Egg of Osseous Fishes.

Dr. John Davy—On the Colour of Man.

Drs. J. H. Gilbert and J. B. Lawes—On the Sources of the Fat of the Animal Body.

Section D.—Department of Anthropology.

E. B. Tylor—Phenomena of the Higher Civilisation Traceable to a Rudimental Origin among Savage Tribes.

Dr. Jas. Hunt—On the Principle of Natural Selection applied to Anthropology, in Reply to Views Propounded by some of Mr. Darwin's Disciples.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

W. G. Palgrave—On Arabia.

John Crawfurd—On the Migration of Cultivated Plants with Reference to Ethnology.

Dr. Mann—On the Physical Geography, Climate, and Tribes of Natal.

Professor Ansted—On the Physical Geography of the Eastern part of the Crimea, and the Peninsula of Taman.

C. R. Markham—On the Aleppy Mud Bank.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Professor A. W. Williamson—Report of the Committee of the British Association on Scientific Evidence in Courts of Law.

Professor Leone Levi—Report of the Committee of the British Association on Uniformity of Weights and Measures.

Joseph White, F.R.C.S., Ed., &c.—On the Statistics of the General Hospital, near Nottingham.

Frederick J. Wilson—On Classification of the various Occupations of the People.

Rev. W. Caine—Some of the Results of the Free Licensing System in Liverpool during the last four years.

SECTION G.—MECHANICAL SCIENCE.

W. J. M. Rankine, LL.D., F.R.S.—On the Influence of Friction in the Cylinder upon the Efficiency of Steam.

Captain Noble, R.A.—On the Penetration of Shot and Resistance of Iron-Clad Defences.

Captain D. Galton, R.E.—A Few Remarks on the Chalmers Target.

Captain Wynants—On Barytic Powder.

J. B. Fell—On Locomotive Engines and Carriages on the Central Rail System for Working on Steep Gradients and Sharp Curves as Employed on the Mont Cenis.

Monsieur Bergeron—Description of a Pneumatic Process for Traction on Steep Inclines.

SATURDAY, AUGUST 25TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Prof. H. J. S. Smith—Report on the Theory of Numbers.

Prof. R. Harley—On Tschirnhausen's method of Transformation of Algebraic Equations, and some of its Modern Extensions.

Prof. R. Harley—On Differential Resolvents.

Prof. Plücker—On Complexes of the Second Order.

Prof. H. J. S. Smith—On a Property of Surfaces of the Second Order.

W. H. L. Russell—On the Hyperelliptic Transcendents (Göpe system).

M. A. Cornu—On a New Geometrical Theorem relative to the Theory of reflection and Refraction of Polarized Light.

A. J. Ellis—On Plane Stigmatics.

A. J. Ellis—On Practical Hypsometry.

SECTION B.—CHEMICAL SCIENCE.

This Section did not meet on Saturday.

SECTION C.—GEOLOGY.

J. F. Walker—On the Lower Green Sand of Bedfordshire.

R. A. Peacock—On a Case of Gradual Change of Form and Position of Land at the South End of the Isle of Walney.

SECTION D.—BIOLOGY.

This Section did not meet on Saturday.

SECTION D.—DEPARTMENT OF PHYSIOLOGY.

This Department did not meet on Saturday.

SECTION D.—DEPARTMENT OF ANTHROPOLOGY.

This Department did not meet on Saturday.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Col. Goldsmid—Notes on Eastern Persia and Western Beloochistan.

Col. Tremenheere—Notes on the Physical Geography of the Lower Indus.

J. Reddie—On the Various Theories of Man's Past and Present Condition.

F. Whymper—Progress of the Russo-American Telegraph Expedition *viâ* Behring's Straits.

Henry H. Howorth—Some New Facts in Celtic Ethnology.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

This Section did not meet on Saturday.

SECTION G.—MECHANICAL SCIENCE.

Fleeming Jenkin, F.R.S.—On a New Arrangement for picking up Submarine Cables.

R. Mushet—On the Treatment of Melted Cast Iron, and its Conversion into Iron and Steel by the Pneumatic Process.

MONDAY, AUGUST 27TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Colonel Sykes—Report of Balloon Committee.

J. Glaisher—Results of Balloon Ascents during the past year.

G. J. Symons—Report on Rainfall.

M. Janssen—On the Spectrum of the Atmosphere and that of the Vapour of Water.

M. Janssen—On a Portable Spectroscope and a portable Hygrometer.

Prof. Rankine—Description of a new Proportion Table equivalent to a Slide-rule 13 ft. 4 in. long, by T. D. Everett, D.C.L.

A. Claudet—On a New Process for Producing Harmonious and Artistic Photographic Portraits.

T. Holmes—On the North Atlantic Telegraph.

SECTION B.—CHEMICAL SCIENCE.

H. Larkin—On the Magnesium Lamp.

Dr. Gladstone—On the Refraction and Dispersion Equivalents of Chlorine, Bromine, and Iodine.

E. T. Chapman and W. Thorp—On the Olefines in Relation to the Isomerism of Vinic Alcohols.

Dr. Bence Jones — On the Chemical Action of Medicines.

J. B. Lawes and J. H. Gilbert—On the Sources of the Fat of the Animal Body.

J. B. Lawes and J. H. Gilbert—On the Accumulation of the Nitrogen of Manure in the Soil.

SECTION C.—GEOLOGY.

Dr. W. H. Ransom—On the Occurrence of Felis Lynx as a British Fossil.

James Oldham—On the Discovery of Ancient Trees Below the Surface of the Land, at the Western Dock now being Constructed at Hull.

F. M. Burton—On the Occurrence of Rhœtic Beds, &c., near Gainsborough.

Mons. Pierre de Tchiatchef—Eight Years' Researches in Asia Minor.

Sir R. I. Murchison—On the Various Tracts of England and Wales in which no Productive Beds of Coal can reasonably be looked for.

H. Govier Seeley—On Some Characters of the Brain and Skull in Plesiosaurus.

H. Govier Seeley—On the Carstone.

SECTION D.—BIOLOGY.

Dr. W. M'Intosh—On a new Molluscoid Animal.

Dr. W. M'Intosh—List of Turbellaria, and Annelida of North Uist.

R. Garner—On the Power which some Rotifers have of attaching themselves by means of a Thread.

Dr. G. D. Gibb—Variations in the great Arterial Blood-vessels.

A. R. Wallace—On Reversed Sexual Characters in a Butterfly, and their Interpretation on the Theory of Modifications and Adaptive Mimicry (illustrated by specimens).

C. Stewart—Notes on the Structure of the Echinoidea Regularia, with Special Reference to their Classification.

E. Ray Lankester—On the Asexual Reproduction and Anatomy of Choetogaster Vermicularis (Müll).

H. Woodward—On some Points in the Structure of Limulus, Recent and Fossil.

Dr. Ransom—On the Structure and Growth of the Ovarian Ovum in the Gasterosteus Leiurus.

Rev. A. Merle Norman—On the Crustacea, Echinodermata, Polyzoa, and Cœlenterata of the Hebrides.

G. S. Brady—Report on the Ostracoda Dredged amongst the Hebrides.

Dr. Cobbold—Supplementary Report on Experiments with Entozoa.

Professor Oswald Heer—On the Miocene Flora of N. Greenland.

SECTION D.—DEPARTMENT OF PHYSIOLOGY.

Dr. Acland—Letter communicating Result of Application to the General Medical Council as to a Grant for Investigating the Physiological Action of Remedies.

Dr. Sibson—On the Movements, Structure and Sounds of the Heart.

Colonel Sir. J. E. Alexander—On the Effects of the Pollution of Rivers.

Dr. B. W. Richardson—Report on Amyle.

Dr. Gamgee.—On the Action of Carbonic Oxide on Blood.

SECTION D.—DEPARTMENT OF ANTHROPOLOGY.

John Beddoe, M.D.—On the Stature and Bulk of the Irish, and on Degeneration of Race.

C. Carter Blake—Skulls from Round Barrows in Dorsetshire.

A. Ernst—Anthropology of Caracas.

John Shortt, M.D.—Habits and Manners of Marvar Tribes of India.

E. B. Bogg—Fishing Indians of Vancouver's Island.

Prof. Leitner—Papers from Lahore.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

General Sir. A. S. Waugh—On Mr. W. H. Johnson's Explorations from Leh to Khoton in Chinese Tartary.

J. Thomson—Visit to the Ruined Temples of Cambodia.

R. H. Major—On Priority in Discovery of the Madeira Group.

Dr. Mann—On the Kaffirs of Natal.

R. W. Payne—On the Trans-Vaal District of South Africa.

Dr. Beke—On the Lake Kurà of Arabian Geographers and Cartographers.

Dr. H. Rònay—On the Voguls.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

James Heywood, F.R.S.—On the Subjects Required in the Classical Tripos Examination, and in the Trinity College Fellowship Examination at Cambridge.

Dr. Daubeny—Statistics as to the Number of Graduates in Arts and Medicine at Oxford for the Last Two Centuries.

E. Renals—On the Influence of Science Classes in Mechanics' Institution.

SECTION G.—MECHANICAL SCIENCE.

S. J. Mackie—On Zinc Sheathing for Iron Ships.

Capt. Wynants, Royal Belgian Artillery—On Barytic Powder for Heavy Ordnance; communicated by C. Vignoles, F.R.S.

Admiral Sir E. Belcher—On the Application of the Expansive Power of moistened Vegetable Matter to the Raising of Weights.

H. Dircks—On Steam Boiler Explosions with Suggestions for their Investigation.

W. D. Gainsford—Descriptions of a Newly Invented System of Ordnance.

W. D. Gainsford—Description of an Invention for Locomotive Adhesion.

TUESDAY, AUGUST 28TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

The President—Report of the Committee on the Transmission of Sound through Water.

Prof. Hennessy—On Meteoric Showers considered with reference to the motion of the Solar System.

M. Hofmann—Remarks on a new Telemeter; a new Polarimeter; a new Polarizing Microscope; and various Spectroscopes.

L. Casella—On a new Anemometer.

C. F. Varley—On Certain Phenomena which presented themselves in Connection with the Atlantic Cable.

C. F. Varley—On a New Method of Testing Electric Resistance.

J. Glaisher—Experiments off Ventnor with Mr. Johnson's Deep Sea Pressure Gauge.

Prof. Rankine—On Tables of Pairs of Stars for the Approximate Finding of the Meridian.

J. P. Joule—Determination of the Mechanical Equivalent of the Thermal Unit by experiments on the Heat evolved by Electric Currents.

E. Whymper—A Novel Experiment to determine the Formation of Glaciers.

Professor Hennessy—On the Diurnal Period of Temperature in relation to other Physical and Meteorological Phenomena.

— Arnold—On the Climate of Aldershot.

F. P. Fellows—On certain Errors in the received Equivalent of the Metre, &c.

SECTION B.—CHEMICAL SCIENCE.

J. A. Wanklyn—Report on Isomeric Alcohols.

A. R. Catton—Report on the Synthesis of certain Organic Acids.

Dr. Bauer—The Action of Chlorine on Amylene.

C. Tomlinson—On some Phenomena connected with the Melting and Solidifying of Wax.

Dr. Janssen—Sur le Spectre de l'Atmosphere Terrestre et celui de la Vapour d'Eau.

Dr. Janssen—Sur une Spectroscope à Vision Directe.

Dr. Lyon Playfair—To draw attention to the present condition of our knowledge on the Origin of Muscular Force in Animals.

J. M. McGauley—The Nature and Properties of Ozone and Antozone Demonstrated Experimentally.

A. Bird—On the Purification of Terrestrial Drinking Waters, by Neutral Sulphate of Alumina.

SECTION C.—GEOLOGY.

Dr. C. Le Neve Foster—On a Curious Lode or Mineral Vein in New Rosewarne Mine, Gwinear, Cornwall.

E. Brown—On the Drift Deposit on the Weaver Hills.

H. Govier Seeley—On the Characters of Dolichosaurus, a Lizard-like Serpent of the Chalk.

Edward Hedley—On the Sinking of Annesley Colliery.

James Oakes—On a Peculiar Denudation of a Coal Seam in Coates' Park Colliery.

Dr. Beke—On the Island of St. John, in the Red Sea. (The Ophiodes of Strabo.)

Prof. Oswald Heer—On the Miocene Flora of North Greenland.

J. E. Taylor—On the Relations of the Upper and Lower Crags near Norwich.

C. W. Peach—Observations on, and Additions to, the List of Fossils found in the Boulder Clay of Caithness, N.B.

Henry Brigg, junr.—On the occurrence of Flint Implements near Thetford, on the Little Ouse.

John Gunn—On the Anglo-Belgian Basin of the Forest-Bed of Norfolk and Suffolk, and the Union of England with the Continent during the Glacial period.

Section D.—Biology.

Dr. Carpenter, F.R.S.—On Comatula rosacea, C. celtica, and other Marine Animals from the Hebrides.

H. Hennessy, F.R.S.—On the probable cause of the existence of a North European Flora in the West of Ireland, as referred to by the late Professor E. Forbes.

C. Spence Bate, F.R.S.—On the dentition of the Common Mole (Talpa Europœa).

W. Tennant—On the traces of an Irish Lake Dwelling, found by Captain L'Estrange, in the County of Cavan.

E. Perceval Wright, M.D.—Notes on Lithosia caniola, with reference to the question of its origin as a species.

John Hogg, F.R.S.—On the ballast Flora of the coasts of Durham and Northumberland.

J. J. Cleater—A few thoughts, speculative and from observation, on Color and Chromula.

W. Moggridge—On the occurrence of Lemna arrhiza in Epping Forest.

W. Moggridge—On the zones of the Coniferæ from the Mediterranean to the crest of the Maritime Alps.

F. Buckland—On the scientific cultivation of a Salmon River.

F. Buckland—On the Exhibition of Fish Culture at Boulogne.

John Hoare—On the Oyster Fisheries in Ireland.

J. K. Lord—To exhibit specimens illustrative of the Natural History of N. W. America.

Browne Thomas—On the application of the Greek and Latin Languages to scientific nomenclature.

E. Perceval Wright, M.D.—Notes (botanical) of a Tour in the Islands of Arran, West of Ireland.

N. B. Ward, F.R.S.—The Poor Man's Garden.

Section D.—Department of Physiology.

Dr. Cobbold—Supplementary Report of Experiments with Entozoa.

Dr. Richardson—Physiological Demonstrations of Local Insensibility.

Dr. Norris—On Muscular Irritability, and the relations which exist between Muscle, Nerve, and Blood.

Dr. Foster—On a Peculiar Change of Colour in a Mulatto.

W. L. Scott—On the Presence of Ammonia and its Homologues in the Blood.

Section D.—Department of Anthropology.

Dr. Paul Broca—Researches into the Anthropology of Lower Brittany.

Professor Huxley—Remarks on Two Extreme Forms of Human Crania.

Dr. James Hunt—Cranial Measurements, Colour of Hair and Eyes, &c., of Modern Norwegians.

A. H. W. Ingram—Exhibition of a Slate Armlet.

J. W. Flower—Notice of a Kjökkenmödding in the Island of Herm.

J. Plant—Human remains from Poole's Cavern.

Dr. Mann—Mental and Moral Characteristics of Zulu Kafirs of Natal.

Vice-Admiral Sir Edward Belcher—Stone Implements of Esquimaux.

W. Bollaert—Central American Hieroglyphs.

E. P. Haughton—Land Dayas of Upper Sarawak.

Section E.—Geography and Ethnology.

P. B. Du Chaillu—On the Physical Geography and Tribes of Western Equatorial Africa.

George Grove—Report on the First Expedition of the Palestine Exploration Fund.

Captain Godwin-Austen—On the Pangong Lake in Thibet.

R. Dunn—On some of the bearings of Archæology upon certain Ethnological Problems and Researches.

Sir Walter Elliott, K.C.B.—On a proposed Ethnological Congress at Calcutta.

The Bishop of Mauritius—On the N.E. Province of Madagascar.

Section F.—Economic Science and Statistics.

Colonel Sykes—Statistics of the Charitable, Educational, Industrial, and Public Institutions founded by the Native Gentry of India during the last five Years.

— Wilkinson—On the Consumption and Cost of Intoxicating Liquors in the United Kingdom in 1865.

— Felkin—Statistics of the Hosiery and Lace Trades in Nottingham.

Rev. A. S. Worthington—Remarks on the Unequal Proportion between the Male and Female Population of some manufacturing and other Towns, with concurrent Phenomena shown by the Registrar-General's Returns.

George Sentor—On the Diminution of Accidents in Coal Mines since the appointment of Government Inspectors.

Thomas Browne—On the Transfer of Real Property.

Section G.—Mechanical Science.

John Daglish—On the Counterbalancing of Winding Engines for Coal Mines.

William Fairbairn, LL.D., F.R.S.—Description of the means employed for removing and replacing in a new position the Iron Columns of a Fire-proof Cotton Mill.

G. D. Hughes—On Rotary Engines, with special reference to one invented by W. Hall.

W. Hooper—On the Electrical and Mechanical Properties of India-rubber Insulated Wire.

George Fawcus—Improvements in Pontoon Trains.

N. P. Burgh—On the Action and Effect of Flame in Marine Boilers.

WEDNESDAY, AUGUST 29th.

Section A.—Mathematical and Physical Science.

Rev. Professor Harley—Remarks on Boole's Mathematical Analysis of Logic.

A. Claudet—On a Variable Diaphragm for Telescopes and Photographic Lenses and a Magnifying Stereoscope with one lens.

Evan Hopkins—On the Depolarization of Iron Ships.

J. Traill Taylor—On a Defect in the Demonstrating Polariscope, with a Simple and Effective Remedy.

H. J. S. Smith—On the Large Prime Number calculated by Mr. Barrett Davis.

W. L. A. Russell—Hyperelliptic Functions (Weierstrass' Method).

C. Willich—On the Partition of the Cube.

Section D.—Department of Physiology.

Dr. Richardson—On the Comparative vitality of the Jewish and Christian Races.

Dr. Foster—Note on an Addition to the Sphygmograph.

W. L. Scott—On the Normal Existence of Quinine as an Animal Principle.

Section D.—Department of Anthropology.

S. Phillips Day—On the Power of Rearing Children among Savage Tribes.

Dr. Gustave Lagneau—Saracens in France.

Professor Tennant—On the Traces of an Irish Lake Dwelling, found by Captain L'Estrange.

H. Prigg—Flint Implements from Drift of Little Ouse Valley.

W. Bollaert—Ancient Engravings on Stone, Southern Peru.

C. Carter Blake—On the Condylus Tertius.

J. Anderson—Recent Exploration in Chambered Cairns of Caithness.

C. S. Wake—Antiquity of Man in Relation to Comparative Geology.

Section E.—Geography and Ethnology.

W. F. Webb and Sir Samuel Baker—On the Researches of Livingstone, with Observations on the Negro Character.

Sir R. I. Murchison, Bart.—On the Reported Discovery of the Remains of Leichardt in Australia.

J. Crawfurd—On the Invention and History of Written Language.

Dr. Charnock—On Andorra.

Section F.—Economic Science and Statistics.

Rev. C. Sewell—On Hindrances to Success of Popular Education.

Thomas Browne—On the Transfer of Real Property.

Charles Tebbut—On the Violation of the Principles of Economic Science caused by the Law of Distraint for Rent.

G. Bell Galloway—On Inventors and Inventions.

Frederick Wilson—On the Occupation and Ownership of Waste Lands.

J. G. Joyce—On the Practicability of Employing a Common Notation for Electric Telegraphy.

The Association closed its proceedings on Wednesday, after one of the most successful meetings which has ever taken place. The numbers attending were 2,303, a total only exceeded on four previous occasions, and then at towns with a far larger population than Nottingham. The reception given by Nottingham to the Association was remarkable, not only for the excellent and liberal arrangements made by the Town for the transaction of the business of the Association, and the public entertainment of the visitors in the shape of *soirées* and other *fêtes*, but for the immense amount of private hospitality accorded to the members by the inhabitants of the town and neighbourhood, who received a very large number into their houses as guests during the meeting. The Excursions to the various places were extremely numerous, and at each place the members were handsomely entertained by some one or more of the residents in the neighbourhood of each locality, to the number of not less than 1,500 persons on the Saturday, as well as about the same number on the Thursday excursions.

COLLECTION OF PERIODICAL LITERATURE FOR THE PARIS EXHIBITION.

In the *Publishers' Circular* for the 1st June, 1866, the collection of periodical and ephemeral literature, now in course of formation by the British Executive for the Paris Exhibition, is thus alluded to:—

"The report of the French Minister upon the Universal Exhibition to be held in Paris next year, declares the intention of his government to be that of making such exhibitions permanent representations of modern society in its various forms of activity. Acting upon this announcement, our Committee of Council on Education have determined to exhibit a complete collection of our periodical literature, containing one specimen of each newspaper, review, literary, artistic, or scientific journal, magazine, tract, pamphlet, or the like published in Great Britain or the colonies during the past year. Even street ballads, which future Macaulays may find not altogether worthless, are to be included in the collection, to which all publishers, editors, and authors concerned are invited to contribute.

"The idea is an excellent one, and marks an advance upon that somewhat grudging recognition of publishing, as one of the features of modern civilisation, which characterised our own Great Exhibition of 1862. The shyness of our Royal Commissioners of anything like literary productions arose, as was admitted, entirely from the system of regarding everything exhibited as a possible object of medals or honourable mention........ Any way, it must be admitted that a complete exhibition of the present state of English literature is a very proper object of a universal exhibition. Mr. Baines, some time since, in a speech in the House of Commons, stated some marvellous facts on this subject; and if such a section had been included in our Exhibition of 1851, there can be no doubt that the collection about to be formed, if it should attain anything like an approach to completeness, would have shown a contrast beyond anything which could be imagined by those who have not inquired into the subject. It would show, we believe, a vast improvement in the literary and artistic qualities of popular literature which could not fail to strike the most hasty observer."

The collection spoken of in these terms in the *Publishers' Circular*—a publication which records periodically all that is done or doing in the world of literature—is now fairly started. Such contributions as have already been made in the shape of newspapers, magazines, pamphlets, and the like, have been sorted and classified under separate heads according to a pre-arranged plan. As far as newspapers—properly so called—are concerned, whether metropolitan or provincial, daily or weekly, it may be said that such arrangements have been made, or are making as will ensure the getting together of a complete collection of periodical literature as represented under that section. But there is another class of publication which it is certainly desirable to have included in the collection, and which just at this time is probably represented more largely in this country than it ever was before—the class, namely, of magazines and reviews of the better sort, appearing quarterly, monthly, or at other regular intervals throughout the year.

A scheme such as this, which is being organised for the express purpose of exhibiting at this great civilisation-show at Paris, a collection which certainly exhibits that civilisation in a way peculiarly distinct and obvious, can surely not be wanting in interest to any among us. Not even the work of the engineer or the mechanician, peculiarly modern as such work is; not the most wonderful achievements of science or mechanical invention can be looked upon as representing the activity of modern civilisation more completely than do these sheets of printed paper which it is proposed to exhibit, and by means of which the minds of all men living in this nineteenth century are so largely, and in the main so wholesomely, influenced. Regarded only from a mechanical point of view, the fact that such enormous numbers of newspapers and other periodicals are diffused among us day after day and week after week is sufficiently surprising. Under this aspect alone the Press has a fair claim to rank among our modern wonders; while under that other aspect, which puts the thing before us in a less material form, and shows us millions of human intelligences instructed and entertained by this wonderful engine of mind-culture, the subject becomes even more capable still of awakening our attention and holding our interest.

It is much to be desired that such a collection as this

should be a complete one, and no pains will be spared on the part of those who are employed by the Commissioners of the Paris Exhibition to make it so; but at the same time it will be obvious that the labours of these last may be materially lightened, and the attainment of their object helped forward, by the co-operation of all those who are engaged in the publication of any kind of periodical of the sort included in the present scheme. It has been mentioned that, in some particular branches of periodical literature the collection is at present deficient. The class of quarterly and monthly reviews and magazines is still almost entirely unrepresented, and this fact is now pressed upon the attention of all editors and publishers of such, in order that they may, if they think proper, supply this deficiency, and so help forward, very materially, a work which, with all the assistance that can be furnished, will not be an easy one to accomplish.

It has been thought that a more central situation than South Kensington might be more convenient for those who were willing to send such periodicals as those above mentioned for exhibition at Paris, and advantage has therefore been taken of the obliging offer of Messrs. Adams and Francis, of Fleet-street, to receive and keep for the Commissioners any copies of works which may be sent to them. A single copy of each review, magazine, or other similar publication is all that is required, and any single number which has appeared within the year 1866 will be available for the collection.

All contributions to be directed to Messrs. Adams and Francis, 59, Fleet-street, E.C., and marked outside, "Collection of Literature for the Paris Exhibition."

THE GREAT MUSICAL PRIZE OF FRANCE.

The *Grand Prix de Rome*, for musical composition, was instituted in France in the year 1802, on the proposition of M. Grétry, member of the National Institute, as the Academy was then denominated. For sixty-one years this prize was awarded by the Academy of the Beaux-Arts, but by the decree which changed the whole system of grand prizes, the competition for the great musical prize was transferred to the Conservatoire, and the second prize and accessists formerly awarded were suppressed.

The conditions of the competition are—that the young musicians or pupils shall be born in France, be under twenty-five years of age, and submit to a preliminary trial which lasts for eight days. Those who are admitted to the final competition are allowed twenty-five days for their prize composition. They are each allotted a separate room in the Conservatoire, take their meals there at a common table, and are not allowed to quit the establishment until their task is accomplished.

This year the number of aspirants who passed the preliminary examination was five, and the subject of the cantata was *Dalila*, a composition for three voices—soprano, tenor, and bass, the poem being the composition of M. Edouard Vierne, for which a prize of 500 francs was established under the will of the late M. Deschaume.

The prize was unanimously awarded to M. Pessard, a oung man of twenty-three, pupil of M. Carafa; and the rize production is pronounced by M. A. Elevart, of the onservatoire, as exhibiting remarkable dramatic feeling. he successful piece was executed by Madame Sasse, M. smael, of the Théâtre Lirique, and M. Sollivet, a mem- er of the Opera chorus, who exhibited his facility as a usician by executing his portion of the music at a few ours' notice. The accompaniment was played on the ano by M. Albert Lavignac. The other competitors e said to have exhibited considerable talent, and the ctory was not therefore an easy one. The unsuccess- l cantatas were performed by MM. Villaret, of the pera, Collin and Inlema, in-door pupils of the Conser- toire, Caron and David, Madame Meillet, of the Grand héâtre of Marseilles, and Mdlles. Marie Roze, and rard, of the Opéra Comique.

The jury was composed of MM. Ernest Boulanger, Duprato, Eunel, Gevaërt, Georges Kastner, Aimé Maillart, Ernest Reyer, and Semet, elected by lot from a list of twenty-two composers, and presided over by M. Auber.

The competitions are conducted in private, but the successful cantata is afterwards performed publicly in the theatre of the Conservatoire, with a full orchestral accompaniment, by the same vocalists who interpreted it before the jury.

It will not be out of place here to mention that the general annual concours of the Conservatoire are just concluded. The competitions conducted in private were concluded on the 17th instant, and those which take place in public commenced on the 20th and ended on the 28th instant.

Fine Arts.

Distribution of Works of Art in France.—The immense amount of patronage extended to the arts by the Imperial Government is indicated by the list of pictures, statues, busts, and other works distributed on the occasion of the late Imperial *fête*. In addition to the works purchased for the galleries of Versailles and the Luxembourg, pictures and statues were sent to no less than 112 local museums; many of these were purchased at the last Paris Exhibition, while others are original works, or copies of the old masters, specially executed on commission for the purpose. The portrait painters received orders during the year for full or half-length portraits of the Emperor and Empress for 38 sub-prefectures, 34 hotels de ville, the Polytechnic School, and the Asylum at Charenton. In addition to all these, pictures were presented to churches and chapels in 52 departments in France. At a moderate calculation, therefore, the number of works ordered or purchased by the Government for public institutions during a single year could not have been far short of 300.

Annual Distribution of Honours in Paris.—The 15th of August, when the *fête* of Napoleon is celebrated, is also the day for the distribution of the medals awarded by the jury of the annual Exhibition of Fine Arts to the pupils of the Ecole des Beaux Arts, and also of the decorations bestowed by the Emperor. The former ceremony takes place in the great square room of the Louvre, under the presidency of the Minister of the Imperial Household and of the Fine Arts, assisted by the Superintendent of that Department, Count de Nieuerkerke, and the professors of the Ecole des Beaux Arts. The announcement of the honours bestowed by the Emperor is made officially in the *Moniteur*, and the list includes a considerable number of artists and literary men. On the present occasion M. R. A. Gautier, Secretary-General of the Minister of Beaux Arts, has received the cross of Grand Officier of the Legion of Honour; M. Gounod, the composer, M. Van Cleemputte, architect, M. Giraud, painter, M. Morel Fatio, Keeper of the Marine and Ethonographical Galleries in the Louvre, and M. Brice, Chief of the Bureau of the Ministry of Beaux Arts, have been raised to the grade of officers of the Order; and the following, amongst others, have been nominated Chevaliers:—M. Rouillard, professor in the School of Design, M. Taine, professor in the Ecole des Beaux Arts, and author of a remarkable work on Italy, of which only one volume has yet appeared; M. Claude, librarian of the Bibliothèque Impériale; the Abbé Martigny, author of several learned works on archæology and history; M. E. G. Rey, the Eastern explorer; M. Céenac-Moncault, historian and archæologist; M. de Baecker, archæologist; the architects, Lefaure, Pellieux; the painters, Carrier, Busson, Gide, Merle, and Schlesinger (Saxon); the sculptors, Carpeax and Gruyère; and the engravers, Merley, Girard, and Girardet (Swiss). The young artist of the Ecole des Beaux Arts who has won the *Grand Prix de Rome* is the

son of the well known natural philosopher and director of the porcelain works of Sèvres, M. Regnault, and pupil of MM. Cabanel and Lamothe. The Minister paid generous tribute to the memory of three deceased artists, the sculptor Nanteuil, and the painters Troyon and Bellangé, and in the latter portion of his address he announced that it had been decided to make another change in the system of voting the rewards, and of the election of the juries of the annual Exhibitions. The Minister referred to the small number of artists who voted for the award of the two grand Medals of Honour, which, it will be remembered, were not granted this year, and expressed it as his opinion that it was difficult for them to undertake the responsibility of deciding who amongst themselves, at once candidates and judges, should receive these great medals. He explained that the arrangements would be modified for the exhibition of next year, and that the jury would, as formerly, have the awarding of the medals of honour. As regards the jury a change is also announced: by the late regulation two-thirds of the members were elected by the artists, and the remainder by the Administration of the Fine Arts; in future, one-third are to be named by the Academy of Beaux Arts, one-third only elected by the artists, and the rest appointed by the Administration, as before. Thus, the Academy, which has been excluded from any part in the management, either of the education of artists or of the annual exhibitions, since the remodelling of the Ecole des Beaux Arts, obtains a voice in the matter, but at the expense of the general body of artists. Another point in the Minister's speech deserves attention. In reference to the coming year, Marshal Vaillant said :—"It is the opinion of the Imperial Government that annual exhibitions are the best encouragement to artists, because they continually draw the attention of the public to works of art; the Emperor therefore has decided that not even the Universal Exhibition itself shall give rise to an exception. It would be an error to conclude that the two exhibitions to be held next year will compete with each other, for the International Exhibition will include works produced since 1855, that is to say for twelve years, and the space not being unlimited recent pictures would stand at a great disadvantage as compared with older works, so that the *salon* of 1867 will be shorn of none of its value."

Commerce.

Algerian Products.—The *Moniteur Industriel* of the 9th August, publishes an interesting account of the natural resources of this colony. It states that these are immense. The mineral products of themselves would alone make the fortune of a colony, its soil contains ores of iron, copper, nickel, zinc, lead, antimony, and mercury sufficient to supply all the wants of France. Stone and marbles of all kinds abound everywhere, among which statuary marble and the translucent onyx are especially sought after by manufacturers of ornamental objects, who make of it clocks, cups, vases, and candlesticks of great value. There are besides numerous mines of rock salt, salt lakes, and salt marshes. To work these mines (the greater part of which are unproductive) there is wanting nothing but capital, and roads to facilitate the transport from the place of extraction to that of exportation. Algeria is the classic land of cereals; it is known that at the commencement of the French occupation she did not produce enough to satisfy her own requirements; now she exports yearly nearly to the value of 120 million francs of grain or flour. Her wheat is much sought after in France for the making of maccaroni, which already rivals the best Italian. No country offers more favourable conditions for the cultivation of oleaginous and saponaceous plants; besides the sesamum, the arachic, linseed, cotton and lentiscus, the colza and the camelina, the castor oil and mustard, the cultivation of which might be indefinitely developed, this country possesses such enormous forests of olive trees, and if proper works for the purpose were undertaken, it might supply all Europe with oil. The export of olive oil has already reached seven millions of francs, but this figure might be easily increased fivefold. The olive trees of Algeria are neither subject to the diseases that often destroy the crops in France, nor do they suffer from falling off, or from frost. There is thus a rich mine for capital to work. Several textile plants grow spontaneously. Some, such as aloes, are suitable for use in the colony; others, such as the dwarf palm, the affa, and the drinn, afford inexhaustible resources for paper-making materials, and for the manufacture of half-stuff, which are becoming scarcer and scarcer in France. Flax is found in a wild state in the colony, and its cultivation holds out every promise of success. The cultivation of cotton, both long and short staple, is attended with the best results, and the produce will bear comparison with that of countries now celebrated for it. Materials for tanning and dyeing are equally abundant. For tanning, may be named oak bark, pine bark, and the sumac; for dyeing, the carthamus, henna (which is used at Lyons for dyeing silk black), cochineal, madder, which grows there admirably, and which is considered in commerce equal to the products of Cyprus and Avignon. Everywhere where the vine has been planted it has succeeded, and the principal markets of France and England are supplied with the early fruit and vegetables of this colony. Her tobacco, the cultivation of which is entirely free, is excellent, and with her better modes of cultivation, drying, and fermentation, it might become equal to that of Java, or the United States, or even that of Havana, and might supply all the markets of Europe. Among the fruit trees, all of which give exquisite fruits in considerable quantity, may be named the almond, the banana, the carob tree, the lemon, the fig, and the orange. Algeria possesses, spread over the whole surface of the country, either in forests of great extent or growing separately, many various species of woods adapted for building and industrial purposes, such as the myrtle, the cedar, the lemon, the carob tree, the Aleppo pine, the pomegranate, the green oak, the olive, the mastic tree, the pistachio, the orange tree, and especially the arbor vitæ, that matchless wood of which Parisian industry has taken possession, and of which it manufactures such charming specimens of cabinet-work. The numerous plantations of mulberry trees already existing afford an opportunity for a much larger development of silkworm cultivation. As to the animal products, Algeria leaves nothing to be desired. She possesses horses sufficient to remount the whole army of Africa. The bovine race is remarkable for its fine proportions. In the Sahara and in the Tell, flocks of sheep constitute the principal wealth of the pastoral tribes. What an enormous quantity of wool might be supplied by ten millions of sheep, if they were fed, sheltered, and cared for as they are in France. The wax, honey, and coral which is fished for on the African coast, are other sources of wealth. The general commerce of Algeria, which has increased in rapid proportions, is already of more than 250,000,000 francs. It consists chiefly in the importations from France and foreign countries, and in the exportation of Algerian produce. We speak only of the existing trade of Sahara, which, little developed yet, may one day attain an extraordinary importance, and for the present we confine ourselves to the Tell, which demands the first attention of the Algerian Society. Shipping also follows the onward career of progress, and will still further increase under the provisions of the new laws, which permit foreign vessels to trade between one Algerian port and another. The tonnage dues, which have occasioned frequent complaints, because it was said that they weighed heavily on French ships, will now equally apply to foreign ships, and will thus permit the industrial products of France and Algeria to compete freely in the Algerian markets with foreign products. New and regular services of

steam-packets are to be established on all the coasts. Messageries Imperiales will replace the government vessels on the lines on which they at present run. The Tonache Company continues its service, also the Talabot Company, the clippers of Cetté, and the vessels of the English company which touch at the principal ports on their way to Alexandria, will augment the commercial activity in the most important towns on the coast. The foregoing gives, in a few words, the actual resources of Algeria, and what they might become when the means of transport are improved, which there, more perhaps than anywhere else, play so important a part.

Trade-Marks.—The *Times* City article says:—"The general sense of what is due alike to the public and the interests of commerce causes the Trade-Marks Act to be enforced in nearly all places with wholesome severity. According to the recent advices from India, the police in June last entered the premises of a printer in Calcutta and seized a large quantity of forged labels of several English manufacturers, among which were those of Allsop and Sons, Lea and Perrins, P. and J. Arnold, Day and Martin, and Crosse and Blackwell. The latter firm immediately commenced a prosecution under the Trade-Marks Act (India), section 485 of the Penal Code, which resulted in the conviction of the offender, and his being sentenced to two years' rigorous imprisonment. A similar punishment was awarded to a native by whom some of the spurious goods upon which the forged labels were placed had been sold."

Colonies.

Manufactures in Victoria.—The Colonial Legislature having last year voted a sum of money to reward founders of new industries, a large number of applications have been made. First come the textile manufactures. Of cloth, the only specimen is some tweed from Wannon mills, which is coarse but strong, substantial, and fit for many valuable uses if its production can be made to pay. A much higher completeness has been obtained in some straw manufactures, which have been forwarded, together with samples of material. The straw used is that of the red Tuscan wheat and rice. Of leather there is a respectable show of bales of different quality, coloured roans, imitation moroccos, and basils, for books or carriages, calf of various degrees of fineness, and fine-dressed kid suitable for gloves, &c. Some slighter evidence of manufacture are to be found in a few woollen tufts, buttons, &c., for ornamenting railway or other carriages. Specimens of blasting powder of colonial invention have also been sent, together with samples of cartridges. A large collection of jams, pickles, &c., have been sent. There are also some good specimens of earthenware, in the shape of vases, jugs, &c. There are also samples of flax, dressed and refuse hemp and tow, hops, Russian hard wheat, and spirits derived from the grass tree.

Progress in New Zealand.—The *Southern Cross* says:—"Since our last monthly epitome of news for England we are enabled to chronicle the steady advance the province is making in actual settlement. The general features of the country are rapidly changing, and the country settlers are contented and thriving. The Waikato settlers are taking root, and will be able, through the help rendered by the Provincial Government, to get over the winter. This will be the severest trial to them. At Tauranga and on the east coast matters are improving, and settlement will progress rapidly there as soon as the Government can complete the surveys and throw open the land. From the northern settlement we hear of nothing but satisfactory accounts. Mr. Walton is opening the coal mines at Wanganui, and coal is now among our articles of domestic produce. On the west coast the trade between Onehunga and Kaipara is increasing so fast that two additional coasters are being laid on as regular traders. From the various settlements along the coast, gum, flax, and agricultural produce come more freely forward than for several years past. In short, our domestic trade has revived very much since the cessation of hostilities. The energies of the settlers are being directed into the proper channel, and with continued peace their efforts will soon tell. Coromandel still yields steady returns of gold."

Publications Issued.

Shipbuilding, Theoretical and Practical, by Isaac Watts, Esq., C.B., late Chief Constructor to the Royal Navy; W. J. M. Rankine, Esq., C.E., LL.D., F.R.S., &c., Associate Member of Council of the Institution of Naval Architects; Frederick K. Barnes, Esq., Department of the Comptrollor of the Royal Navy, Member of the Council of the Institution of Naval Architects, &c.; James Robert Napier, Esq., Shipbuilder and Marine Engineer, Glasgow, President of the Institution of Engineers in Scotland, &c.; with, as corresponding and general Editor, W. J. Macquorn Rankine, C.E., LL.D., F.R.SS.L. & E., Professor of Civil Engineering and Mechanics in the University of Glasgow, &c., &c. *(W. Mackenzie.)* This treatise includes contributions by eminent practical shipbuilders, and provides a complete system of information on the art of shipbuilding, and on the scientific principles on which it is founded, at a price not beyond the means of the general body of practical men who are engaged in that art. There is a growing interest felt in the education of British naval architects, and a strong desire that it shall not fall short of what is now being accomplished in France. Hence one object of the work is to lay down scientific principles of naval architecture in as clear and plain a manner as possible, for the benefit more especially of young students who may desire to be well grounded, in order that they may afterwards advance without hesitation in the prosecution of their honourable and useful profession. The work extends to 300 pages, illustrated by extensive tables, more than 100 woodcuts, and by upwards of 30 large plates of ships and engines, taken from models whose excellence has been proved by their practical success. The first part relates to the hydraulics of shipbuilding, or buoyancy, stability, speed and design, and explains the scientific principles which guide the naval architect in designing a ship, so that she shall possess the properties required of her, as to displacement, steadiness, and speed, in order that she may fulfil her practical object; and in computing the power which will be required to drive her at her intended speed, whether by sails or steam. The second part takes the geometry of shipbuilding, or modelling, drawing, and laying-off, and describes the methods by which the model and plans of an intended ship are constructed, and the figure and dimensions of her parts laid of. The third part sets forth the facts and principles known as to the strength of the materials of which ships are built, whether timber or iron, and the application of those facts and principles to practice. The fourth describes practical shipbuilding, and the processes gone through in shaping and putting together the materials treated of in the preceding part, during the actual building of ships, together with their whole structure and fittings. The fifth treats of the masts, sails, and rigging, and of the principles of propulsion of a ship by sails, and the structure of the parts which effect that propulsion. The sixth part sets forth the scientific principles of the propulsion of a ship by steam power, and the practical rules which regulate the construction and working of her engines. And the seventh explains the principles and practice of the art of building and fortifying vessels of war of different kinds, and is also illustrated by plates of H.M.S. *Warrior*, engraved from copies of official drawings authorised by the Lords of the Admiralty to be made for this work.

Notes.

Metropolitan Sewage Irrigation.—It appears by the report of the directors of the Metropolitan Sewage and Essex Reclamation Company that in order to demonstrate the truth of statements made before Parliament and elsewhere, that Maplin sand irrigated by sewage would produce luxuriant crops of grass, the directors caused upwards of 3,000 tons of sand to be brought up in barges from the Maplins, taken from a spot about a mile and a half out to sea, and spread two feet deep over an acre of land at the outfall reservoir at Barking Creek. The plot was spread in the early part of March last, was sown with Italian rye grass on the 14th April, and was fertilised exclusively with sewage. The first cutting made on the 20th June, from a portion of the acre, which was again cut on the 17th July; and the grass, exhibited at the Essex Agricultural Show on that day, representing as it did only twenty-seven days' growth, weighed at the rate of 14 tons an acre. Another portion of the same plot, which was cut for the first time on the 7th July, weighed at the rate of 16 to 20 tons an acre. With the further object of proving the value of sewage, the directors have leased a farm near Barking, to which an iron pipe is now being laid in advance of the main culvert, and they hope very shortly to show the Essex farmers, that by laying out a moderate portion of their land for irrigation they would not only derive a profit from the increase in their stock (which seven or eight annual cuttings of grass will enable them to make), but they would have the opportunity highly and profitably to manure the remainder of their land worked in the ordinary manner. It is hoped that the example thus set will be immediately followed by the Essex farmers as soon as the works shall have advanced sufficiently to enable the company to supply them with sewage. In conclusion, the directors congratulate the shareholders on the growing appreciation of the value of sewage, which is proved by the number of provincial towns that are following the example of the metropolis.

The Academy Della Crusca.—A communication from Florence, in the *Moniteur*, has the subjoined:—"A recent decree of the lieutenant of the kingdom modifies the constitution of the celebrated Florentine Academy of Della Crusca. By the terms of this decree the condition of Tuscan origin, previously exacted in order to obtain the title of resident academician, is abolished; henceforth, a fixed domicile at Florence will be sufficient. Moreover, the number of resident academicians is increased to eighteen. The Academy Della Crusca (of the bran), or 'Academia furfuratorum' (academy of bolters of bran), was founded in 1582, on the initiative of the poet Francesco Grazzini. The object of the foundation was to purify the Italian language, 'by removing the bran from the flour,' hence the name of the society, and hence also its emblem and motto, a sieve, with the inscription, 'Il piu bel fior ne coglie' (it plucks the finest flour). The Crusca published at Venice, in 1612, its first dictionary, in a single folio volume; but the work has progressively increased to six such volumes (edition Florence, 1729–38). Since then it has been an authority without appeal as regards the language, and the writers whose phrases or expressions had been admitted by the academy, such as Macchiavelli, Boccaccio, and others, were called Della Cruscan writers. To this academy were joined two others, more ancient, the foundation of which dates from the first half of the sixteenth century, those of the 'Apathetics' and the 'Moist;' and the three fused together bear to-day the name of Royal Florentine Academy. The curious appellations just mentioned were not peculiar to the learned societies of Florence. Amongst contemporaneous creations of the same class in other intellectual centres of Italy may be mentioned the Academies of the Confounded, the Sleepers, the Wide-awakes, the Inflamed, the Insipids, the Thunderers, the Corpses, and the Vagabonds. A German who wrote in 1725 reckons not less than six hundred of these societies existing at that period. No city was without one, and some had as many as twenty.

Patents.

From Commissioners of Patents' Journal, August 24th.

Grants of Provisional Protection.

Animal substances, preserving—1904—J. Morgan.
Armour plates, rendering inoxidisable—1934—C. E. Brooman.
Bolts and spikes—1900—M. Bayliss.
Circular saws, grinding and polishing—1812—E. McNally.
Dyeing and printing, alkaloid colouring matters for—1913—G. T. Bousfield.
Electricity, generation and transmission of—1878—J. P. Gillard.
Eyeletting machines—1095—W. Y. Edwards.
Fire-arms, &c., primings for—1896—G. Canouil.
Fire-arms, toy-arms, and detonating toys—1897—G. Canouil and F. A. Blanchon.
Furnaces—1892—R. Hooper.
Grate bars—1916—J. H. Johnson.
Intaglios, printing from metal in gelatinous ink—1918—W. B. Woodbury.
Kilns and furnaces—1752—H. A. Bonneville.
Lamps—1930—J. and J. Hinks.
Locomotive engines for steep inclines—1840—A. W. Makinson.
Marine boilers, feed-box for—1890—H. Trotman.
Meat, &c., implement for cutting and beating—1910—L. L. Sovereign.
Nail-making—1894—T. H. Lucas.
Railway waggons, tipping coal, &c., from—1886—W. E. Nether[illegible].
Reaping machines—1920—T. Corbett.
Rice, hulling and finishing—1922—W. E. Newton.
Segment shells—1914—A. Noble.
Sewing machines—1884—F. Neidlinger.
Sewing machines—1908—A. Kimball.
Sewing machines—1936—G. B. Woodruff.
Stables for horses—1040—J. Haworth.
Steam boilers, prevention of incrustation in—1924—E. P. H. Vaughan.
Steel-manufacture—1938—W. E. Newton.
Tin and terne plates—1902—J. Saunders and J. Piper.
Tubes and skewers for cops—1928—J. Strang.
Wool, condensing—1882—S. Longbottom and T. Shaw.

Inventions with Complete Specifications Filed.

Heating apparatus—2106—W. R. Lake.
Sewing machines—2112—A. L. Wood.
Colour-printing, inking apparatus for—2138—G. Haseltine.
Railway carriage springs—2140—J. Murphy.

Patents Sealed.

598. H. Wilson.	652. E. E. Colley and W. [illegible]
599. R. Yeates.	677. M. Henry.
600. G. Zanni.	707. J. Hunt.
614. J. B. Booth.	729. R. Larkin.
618. G. Cowdery.	782. T. Briggs, jun.
622. C. Powell.	

From Commissioners of Patents' Journal, August 28th.

Patents Sealed.

621. J. D. Dow.	651. W. E. Newton.
623. A. C. Andrews.	654. N. Thompson.
624. E. Cottam.	670. G. L. Leclanché.
626. J. Skinner.	671. C. W. Siemens.
627. W. Weldon.	685. J. Chubb.
628. W. Weldon.	718. A. T. Machattie.
632. W. B. Caulfield.	903. R. M. Graystock.
634. W. Conisbee.	945. G. Davies.
641. J. Tansley.	1281. J. Marsh.
644. J. W. Friend.	1622. W. E. Newton.
646. G. Prentice and A. B. Inglis.	

Patents on which the Stamp Duty of £50 has been Paid.

2066. W. Galloway and J. Galloway.	2097. H. F. McKillop.
2077. R. Thompson.	2128. J. Alison.
2088. S. Moore.	2129. C. Harratt.
2120. W. E. Newton.	2145. G. Attock.
2132. H. W. Putnam.	2222. W. Clark.
2149. B. L. Burnett.	2113. D. Blake.
2159. W. Clark.	2137. W. Whitworth and J. Wrigley.
2092. A. Jobson.	2143. J. Dodge.
2140. F. C. P. Hoffmann.	2198. J. B. York.

Patents on which the Stamp Duty of £100 has been Paid.

1995. T. Aveling.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 7, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Proceedings of Institutions.

SOUTH STAFFORDSHIRE EDUCATIONAL ASSOCIATION.—Mr. Jones, who, in addition to other appointments, has, for the last six years, acted as the agent, and, for the greater part of the time, as the secretary, to the above Association, has recently been elected Secretary to the North of England Iron Trade. The secretaryship of the Association has, for the present, been accepted by Mr. F. Talbot, Messrs. Chance's Schools, Smethwick, near Birmingham, to whom all communications for the Association should in future be addressed.

THE WEST RIDING EDUCATIONAL BOARD held their annual meeting in Ledsham Park, on Wednesday, the 22nd August. To this spot they had been kindly invited by the Rev. J. B. Landon, the vicar of the parish, the examiner in this district for the Oxford Middle-class Examinations. The absence of two gentlemen from this gathering was the subject of general regret. Mr. Barnett Blake, the intelligent, cheerful, and indefatigable secretary of the Board, had passed away since the last meeting, and the feeling of regret was general that the Society had lost his services, and many of the gentlemen present a warm, good humoured, and agreeable friend. The absence of another gentleman, Mr. James Hole, well known and appreciated for his labours in the field of social science, and also for his devotion to the advancement of the interests of the working classes, was also deplored. The Rev. J. B. Landon occupied the chair, and after having alluded to the pleasing character attaching to such a gathering, paid a tribute to the memory of Mr. Barnett Blake, whom he described as a man of unflinching energy, one whom they could not help respecting, and to whom they owed a debt of gratitude for the great benefits he had conferred upon that and many other institutions.—Mr. H. H. Sales, honorary secretary, then read the annual report, which gave a very cheering account of the operations of the Board. Year by year greater interest was manifested in its proceedings, and its influence was extending far and wide.—A number of reports from the managers of Mechanics' Institutions at Halifax, Holbeck, Hunslet, Middlesbro', Ossett, Reeth, Stockbridge, Thirsk, and Wakefield, testified to the value of the stimulus afforded by the Board to the members who are engaged in laudable efforts for self-improvement after labour hours are past, while the opinions in favour of the middle-class examinations of the Board given by experienced schoolmasters were equally satisfactory. Whether the Board shall during the ensuing year increase the usefulness and extent of its operations depended upon the measure of support it received from those upon whom the privilege and responsibility rested of ministering of their substance for the promotion of the national weal, the aggregation of individual success, of which the primal cause is education.—Mr. Baines, M.P., in moving the adoption of the report, expressed the very great pleasure he felt at being present on that occasion. The Board, he said, owed a very deep debt of gratitude to the reverend chairman for his services, and he believed there was no single individual in the county of York to whom the examinations were more indebted. He further spoke of the good that was being done throughout the country by these examinations, in consequence of the results being recognised in so public a manner; and said that he therefore believed the reverend chairman had conferred a most important service upon the education of Yorkshire by the pains he had taken in superintending the examinations, and he (Mr. Baines) trusted he would continue to favour the Board in the same way. —The Rev. J. Longsden, in seconding the resolution, spoke of the importance of individual exertion in promoting the success of the educational efforts of the Board.—Mr. Dawson proposed, "That this meeting recognises the great and increasing influence of the West Riding Educational Board, and pledges itself to endeavour to extend its advantages by making known its operations, and by increasing its financial resources." —Councillor Gaunt seconded the proposition.—Mr. J. P. Hodgson moved, "That the several examinations held by the Board provide an effectual mode of testing the soundness of the education imparted in Institutes and schools, and afford healthy stimulants to exertion to teachers and pupils, and are therefore worthy of public support, as the benefits thus conferred are shared by the community at large."—Mr. Traice supported the motion, which, in common with others of a more formal character, were unanimously agreed to.—The children of the Orphan School then sang in a pleasing manner several vocal selections, after which Mr. Blyth, formerly organist at Magdalen College, Oxford, favoured the company with two songs. The proceedings, which had throughout been of a very harmonious character, terminated with the singing of the National Anthem.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(Continued from page 651).

LATIN AND ROMAN HISTORY.

THREE HOURS ALLOWED.

SECTION I.

Translate:—

Sin autem ad pugnam exierint-nam saepe duobus
Regibus incessit magno discordia motu;
Continuoque animos vulgi et trepidantia bello
Corda licet longe praesciscere; namque morantes
Martius ille aeris rauci canor increpat, et vox
Auditur fractos sonitus imitata tubarum;
Tum trepidae inter se coëunt pennisque coruscant,
Spiculaque exacuunt rostris, aptantque lacertos,
Et circa regem atque ipsa praetoria densae
Miscentur, magnisque vocant clamoribus hostem;
Ergo ubi, ver nactae sudum camposque patentes,
Erumpunt portis, concurritur, aethere in alto
Fit sonitus, magnum mixtae glomerantur in orbem,
Praecipitesque cadunt—non densior aëre grando,
Nec de concussa tantum pluit ilice glandis.

1. Parse fully, giving both syntax and accidence, the words *regibus, corda, sonitus, rostris, concurritur, glandis.*

2. Give the present and perfect tenses indicative active and the supines of the verbs *praesciscere, fractos, miscentur, nactæ, erumpunt, cadunt.*

SECTION II.

Ipsa ego te, medios quum sol accenderit aestus,
Quum sitiunt herbae et pecori jam gratior umbra est
In secreta senis ducam, quo fessus ab undis
Se recipit, facile ut somno aggrediare jacentem.
Verum ubi correptum manibus vinclisque tenebis,
Tum variae eludent species atque ora ferarum:

Fiet enim subito sus horridus atraque tigris
Squamosusque draco et fulva cervice leaena,
Aut acrem flammae sonitum dabit atque ita vinclis
Excidet, aut in aquas tenues dilapsus abibit.
Sed quanto ille magis formas se vertet in omnes,
Tanto, nate, magis contende tenacia vincla,
Donec talis erit mutato corpore, qualem
Videris, incepto tegeret quum lumina somno.

1. Parse fully, giving both syntax and accidence, the words *pecori*, *senis*, *somno*, *correptum*, *cervice*, *corpore*.
2. Give the present and perfect tenses indicative active and the supines of the verbs *ducam*, *aggrediare*, *dabit*, *dilapsus*, *contende*, *videris*.

SECTION III.

Translate:—

Tum Sabinae mulieres, quarum ex injuria bellum ortum erat, crinibus passis scissaque veste victo malis muliebri pavore ausae se inter tela volantia inferre, ex transverso impetu facto dirimere infestas acies, dirimere iras, hinc patres hinc viros orantes, ne se sanguine nefando soceri generique respergerent, ne parricidio macularent partus suos, nepotum illi, hi liberum progeniem. "Si adfinitatis inter vos, si conubii piget, in nos vertite iras. nos causa belli, nos vulnerum ac caedium viris ac parentibus sumus. melius peribimus quam sine alteris vestrum viduae aut orbae vivemus." movet res cum multitudinem tum duces. silentium et repentina fit quies; inde ad foedus faciendum duces prodeunt, nec pacem modo sed civitatem unam ex duabus faciunt, regnum consociant, imperium omne conferunt Romam.

1. Parse fully, giving both syntax and accidence, the words *crinibus*, *acies*, *sanguine*, *nepotum*, *vulnerum*, *civitatem*.
2. Give the present and perfect tenses indicative active and the supines of the verbs *inferre*, *respergerent*, *movet*, *prodeunt*.
3. Explain why *respergerent* is in the subjunctive mood and imperfect tense.

SECTION IV.

Translate:—

Tum vero in dies infestior Tulli senectus, infestius coepit regnum esse. jam enim ab scelere ad aliud spectare mulier scelus, nec nocte nec interdiu virum conquiescere pati, ne gratuita praeterita parricidia essent: non sibi defuisse, cui nupta diceretur, nec cum quo tacita serviret; defuisse, qui se regno dignum putaret, qui meminisset se esse Prisci Tarquini filium, qui habere quam sperare regnummallet. "Si tu is es, cui nuptam esse me arbitror, et virum et regem appello: sin minus, eo nuno pejus mutata res est, quod istic cum ignavia est scelus. quin accingeris? non tibi ab Corintho nec ab Tarquiniis, ut patri tuo, peregrina regna moliri necesse est; di te penates patriique et patris imago et domus regia et in domo regale solium et nomen Tarquinium creat vocatque regem. aut si ad haec parum est animi, quid frustraris civitatem? quid te ut regium juvenem conspici sinis? facesse hinc Tarquinios aut Corinthum, devolvere retro ad stirpem, fratris similior quam patris.

1. Parse fully, giving both syntax and accidence, the words, *scelere*, *sibi*, *regno*, *penates*, *animi*, *Tarquinios*.
2. Give the present and perfect tenses indicative active and the supines of the verbs *diceretur*, *accingeris*, *conspici*, *facesse*.
3. Explain why *serviret* is in the subjunctive mood, and why *defuisse* in the infinitive.

SECTION V.

1. Describe the office of Prætor. When was the office instituted, and when opened to the plebeians?
2. Give an account of the first Latin league.
3. Why was the Tribunate instituted, and what were its powers and privileges?
4. Write a short history of Cincinnatus.
5. When did Rome become a maritime power? Give an account of her naval successes.
6. Give an account of the first Punic war.

SECTION VI.

1. When did Rome first come into contact with Greece, and by what steps was she led on to the conquest of that country?
2. Give an account of Cicero.
3. Give an account of the Social War.
4. On what occasions was the Roman State in very great danger? and how was it saved?
5. Write a short history of Pompey.
6. What was the treaty of Brundisium? what were its results?

FRENCH.

THREE HOURS ALLOWED.

PART I.

Candidates for a third-class certificate are requested to translate into English the two following extracts, and to answer the grammatical questions thereto annexed, in the order in which they are placed. This first part is all that will be expected of them.

Translate:—

Il y avait du temps de François 1er un brave paysan du Périgord, qui s'appelait Bernard Palissy. Dans ce temps-là, n'avait pas des assiettes de faïence qui voulait. C'était une fabrication dont les Italiens seuls possédaient le secret, et Bernard, qui savait déjà quelque chose en sa qualité d'ouvrier verrier, se mit en tête de le découvrir à lui tout seul. Le voilà donc qui se fait potier sans demander conseil à personne, qui bâtit des fours, ramasse du bois comme il peut, fabrique ses premiers pots tant bien que mal, allume son feu, enfourne, et attend. Il en eut pour 15 à 16 ans avant de réussir, 15 à 16 ans d'essais ruineux qui auraient découragé un grand seigneur. Mais lui, dès qu'il avait pu ramasser quelque argent avec ses vitraux, il retournait à son œuvre avec une persévérance indomptable, insensible à la misère, sourd aux moqueries des voisins, inébranlable aux malédictions de sa femme, qui était furieuse, comme bien vous pensez, de faire avec lui de l'héroïsme, sans en avoir la moindre envie. Or, un beau jour, voilà une grande rumeur à La Chapelle-Biron: c'était son village. "Bernard est devenu fou," disaient les gens; "il brûle sa maison pour faire cuire ses pots." Et c'était, ma foi, la vérité. Le bois étant venu à manquer, pendant qu'une fournée était au feu, Bernard avait commencé par prendre la palissade du jardin, puis les grosses tables, puis enfin le plancher de la maison. Ce que pouvait dire la femme, je vous le laisse à juger; mais lui n'écoutait rien, et les yeux fixés sur l'implacable fourneau, comme un soldat sur sa consigne, il jetait et jetait, ne pensant qu'à son œuvre en danger. Le plafond aurait suivi le plancher, si les pots n'avaient fini par se cuire à point.—Jean Macé, *Histoire d'une Bouchée de Pain.*

And also:—

Un jour que de l'Etat le vaisseau séculaire
Fatigué trop long-temps du roulis populaire,
Ouvert de toutes parts, à demi démâté,
Sur une mer d'écueils, sous des cieux sans étoiles,
Au vent de la Terreur qui déchirait ses voiles,
S'en allait échouer la jeune Liberté;
Tous les rois de l'Europe, attentifs au naufrage,
Tremblèrent que la masse, en heurtant leur rivage,
Ne mît du même choc les trônes au néant;
Alors, comme forbans qui guettent une proie,
On les vit tous s'abattre avec des cris de joie,
Sur les flancs dégarnis du colosse flottant.
Mais lui, tout mutilé des coups de la tempête,
Se dressa sur sa quille, et relevant la tête,
Hérissa ses sabords d'un peuple de héros,
Et rallumant soudain ses foudres désarmées,
Comme un coup de canon lâcha quatorze armées,
Et l'Europe à l'instant rentra dans son repos.

A. Barbier, *Iambes.*

1. Give the five primitive tenses of each of the fol-

lowing verbs which occur in the above extracts:—*voulait savait, se mit, se fait, bâtit, peut, attend, est devenue disaient, cuire, prendre, aurait suivi, ouvert, vit, s'abattre.*

2. Explain the meaning of *brave* as used in the first sentence of the first extract. Show also the difference between *un grand homme* and *un homme grand.*

3. Name the nominative case of the verb *avait,* in the second sentence of the same extract:—"*Dans ce temps là,' &c.*

4. What is the singular of *vitraux?* Give also the singular of the substantive *baux.*

5. "*De l'héroïsme.*" Is the *h* silent or aspirated in *héros, héroïne,* and *héroïque?* Explain, in reference to this question, the exact nature of the aspirated *h* in French.

6. "*Les yeux fixés sur,* &c.," (last line but three of the first extract). Why not *ses yeux?* Give the rule.

7. Explain the word *ne* which begins the 9th line of the second extract. Can you give other instances of a similar construction?

8. Give, with examples taken from the second extract, the different meanings and constructions of the preposition *de.*

9. Parse the first six lines of the second extract.

10. "*Il en eut pour* 15 *à* 16 *ans, &c.*" When are you to render 15 or 16 by 15 *ou* 16, when by 15 *à* 16?

11. Give the different meanings, with a corresponding difference in the gender, of the words: *crêpe, hymne, mémoire, mousse, poële, tour, voile.*

12. Write in full:—*Page* 300; 220 *hommes; l'an* 1500; 85 *volumes; chapitre* 80; 500 *chevaux.*

13. Explain the grammatical difference between *chaque* and *chacun;* between *notre, votre,* and *le nôtre, le vôtre;* between *quelconque* and *quiconque;* and between *quelque* and *quel que.*

14. Translate and explain the following words:—*cru, crû; creuse; cours, court; eu, eux; font, fonts; las; les; lis; lus; mets, mes; mis; mors, mort; ris, riz; va; vis; vive; vu.*

PART II.

Candidates for a second-class certificate are to answer the last three questions in Part I., together with those in Part II., and to translate the English extract and idiomatic expressions which follow:—

1. How do you convey in French the emphasis or contradistinction implied in each of the following sentences?

He may think so, but *I* do not.
You will injure *yourself,* not *him.*
Your ways are not *my* ways.
A la guerre comme à la guerre, as *we* Frenchmen say.

2. Being given these two sentences:—They made him drink; they made him drink some wine; the pronoun "him" will be rendered by a different case in each sentence. Explain this peculiar rule, and name the other verb, besides *faire,* to which it applies.

3. Which are the words that are always accompanied by the pronoun *en,* when they are the "object" of the verb, and the noun to which they refer is not expressed at the same time?

4. In what particular sense is the word *autrui* used to express *another* or *others?*

5. Give the adjective that corresponds to each of the following nouns:—*Ciel, terre, mer, an, trimestre, mois, semaine, jour, siècle, moine, église, évêque, matin, nuit, tête, os, muscle, nerf, sang, vie, œil, oreille, nez, bouche, poil, graisse, huile, fer, bitume, eau, pain, air, travail, sècheresse, secret, calme, apathie, énergie, santé, vol.*

6. Distinguish between "C'est à lui *à* parler" and "c'est à lui *de* parler," and also between "Il impose" and "Il en impose."

Translation:—

A friend of Dean Swift one day sent him a turbot as a present by a servant lad who had frequently been on similar errands, but who had never received the most trifling mark of the Dean's generosity. Having gained admission, he opened the door of the study, and abruptly putting down the fish, cried very rudely, "Master has sent you a turbot." "Young man," said the Dean, rising from his easy chair, "is that the way you deliver your message? Let me teach you better manners; sit down in my chair; we will change situations, and I will show you how to behave in future." The boy sat down, and the Dean, going to the door, came up to the table with a respectful pace, and making a low bow, said, "Sir, my master presents his kind compliments, hopes you are well, and requests your acceptance of a small present." "Does he?" replied the boy; "return him my best thanks, and there's half-a-crown for yourself." The Dean, thus drawn into an act of generosity, laughed heartily, and gave the boy a crown for his wit.

Idioms:—

1. On lui a donné du fil à retordre.
2. J'ai pensé coucher à la belle étoile.
3. Envoyez-les donc promener une fois pour toutes.
4. Vous avez fait là un pas de clerc.
5. Ne vous y fiez pas; il n'est pire eau que celle qui dort.
6. Ne vous laissez pas prendre à ses airs de sainte-n'y touche.
7. C'est un homme tout rond qui n'y va pas par quatre chemins.
8. Je vous le dis en bon français, cela ne me va pas du tout.
9. Il fait le bon apôtre, mais je sais à quoi m'en tenir.
10. Touchez là, et qu'il n'en soit plus question.
11. Il fallait voir comme ils s'en sont donné à cœur-joie!
12. Les pauvres gens, ils auront bientôt repris le collier de misère.

PART III.

Candidates for a first-class certificate are expected to translate the above idioms and English extract, and to answer in French the grammatical questions Nos. 1, 3, and 5, in Part II., as also the following:—

Literature.—1. Show the influence exercised upon their age, in and out of France, by the great literary men of the 18th century, and more especially by Voltaire and Montesquieu.

2. Name the principal works of J. J. Rousseau, Helvétius, Diderot, D'Alembert, Le Sage, Raynal, Buffon, Condillac, Vertot, Bernardin de St. Pierre, Volney, Beaumarchais, and Condorcet. Give a short critical account of any *one* of those works.

History.—Explain some of the most ostensible causes which brought about the Great Revolution of 1789.

(To be continued.)

PARIS EXHIBITION OF 1867.

The whole of the Champ de Mars, as far as the footpaths of the Avenues de Suffren and de la Bourdonnais, from the Quai d'Orsay, and from the road that passes in front of the Ecole Militaire, is enclosed with a palisading of strong planking four metres in height and spiked on the top. There is now no opening on the north side of this vast circumference. On the south, east, and west, there are still three small openings, which will, however, be closed by the 15th of this month. There is extraordinary activity in the workshops of Montataire. The north-eastern and north-western corners of the Champ de Mars will soon be planted with trees from every country. The little park of the Viceroy of Egypt will be planted with palms. The roofing of the Gothic church, which will contain the exhibition of religious art, is in progress. The platform and the parapets of the iron bridge on the Quai d'Orsay are nearly finished. This will put the exhibition in direct communication with the part which is being organised above the Pont de Jena on the left bank. The framework of the roof of the immense building of the International Club, in front of the Pont de Jena, on the right hand on entering the Champ de Mars, will soon be put up. It is of two

stories, with a roof over part of the ground floor and sixteen windows coming down to the floor at the front and back, and eight at each end on each story. A remarkable city is being raised up, as if by enchantment, in the four corners of the Champ de Mars, the part not required for the Palace of the Exhibition. Two very curious lakes, with rocks, are constructed in front of the Ecole Militaire. The four groups of figures on the pedestals in angles of the Pont de Jena are being restored. The road workmen are setting out the granite kerbing in front of the Pont de Jena, and at the north on the ground of the Trocadero—1st, La Place du Roi de Rome; 2nd, the new boundaries of the Quai de Billy; 3rd, the Boulevard de Jena; 4th, the Boulevard de Passy, which corresponds with the Boulevard de Jena.

Of all the specimens of art, of industry, and of human genius, which will be admired in the Exhibition of 1867, one of the most singular will be a building in which will be brought together everything relating to religious art, and will cover a site for which has been reserved an area of 1,875 square mètres. The building will be divided longitudinally into three naves. Immediately on entry there are two vast chapels, forming the arm of a cross; in the lateral naves will be placed two other chapels, making five which radiate round the apse. The building will be lighted by forty openings, in which will be exhibited painted glass in different styles. The chapel will unite in the interior all that art can produce for catholic worship—altars, pulpits, statues, confessionals, ways of the cross, bronzes, chasubles and other sacerdotal vestments, musical instruments, the great organ, the choir organ, harmonium, pavements, windows, wall paintings; and these objects being in harmony with the whole will be duly appreciated. On the outside the public will have brought before them everything relating to the ornament of religious structures—different modes of roofing, pedestals, galleries, spires, works of art, works in lead and zinc, and all that tends to give to the building an architectural character.

MUSICAL EDUCATION IN FRANCE.

The whole of the classic Solfeggios of Chérubini, Méhul, Catel, and Gossec, and the minor Solfeggio and Tables of Musical Readings of M. Edouard Batiste, adopted in the junior classes of the Conservatoire of Paris, have been re-edited, and two reports have been made upon the work by the Committee of Studies of the Conservatoire, headed by its Director, M. Auber. In the report on the former work the committee says, these celebrated Solfeggios have been and still are the basis of instruction in the Conservatoire, and therefore the new edition of the work of the great masters, published by M. J. L. Hengel, with the assistance of M. Edouard Batiste, professor of the Conservatoire, and who was for many years the accompanyist of the examinations and competitions, has been examined in its most minute details. The traditions of these classic solfeggios were familiar to M. Edouard Batiste, and he has proved the fact in his remarkable *basses chiffrées* for the piano or organ. This work, executed with as much conscientiousness as talent, enables pupils as well as professors to accompany with their veritable harmony the solfeggios of the Conservatoire, rendered also more practical and more progressive by means of transpositions and double notes, calculated to facilitate their study in all voices. The best lessons of the solfeggios of Italy are included in the new edition, for the study of the solfeggio should not be confined to the formation of readers, it should also prepare singers, as is stated in the preliminary instructions of the great masters, Chérubini, Méhul, Catel, and Gossec, for the development and preservation of the voice. The committee remark that the editor of the new edition has not confined himself to the production of a new and very correct version of the solfeggios of the Conservatoire, but has also taken equal care in correcting errors in the early editions without any modification whatever of the texts and *basses chiffrées*. Young musicians may therefore compare the two editions, and make a complete study of the *basses chiffrées*, with relation to practical harmony.

As regards the minor or introductory solfeggio of M. Edouard Batiste, and the exercises which form its indispensable atlas, the committee says, that although composed for the youngest voices, and for purely elementary classes, the work is remarkable for its exercises, and its lessons in melody irreproachable in their construction, as well as by its interesting and purely-written accompaniments. The musical principles are therein carefully set forth; the major and minor scales, as well as the modulations, are presented and defined with great clearness; and all the rhythmical combinations of the different measures are developed with that progressive order which evinces a laborious and patient experience in the teaching of music. Finally, the reproduction, in a large form, of the exercises in question, admit of their introduction in the combined classes of Orpheonists, as well as in colleges and schools.

The reports of the committee in question are also approved by the musical section of the Institute of France, —MM. Carafa, H. Berlioz, and Ch. Gounod, by all the professors of the Conservatoire, not members of the committee, and by the Directors of the schools of Lille, Toulouse, Marseille, Metz, and Nantes.

AGRICULTURAL COMMISSION IN FRANCE.

The Minister of Agriculture and Public Works has issued a list of interrogatories to be used in the agricultural inquiry ordered to be undertaken throughout the empire, by a decree of the present year. These interrogatories, which are sent to the prefects for distribution, apply only to that portion of the evidence which is to be taken in writing; the oral examinations will commence in the course of September. At first it was intended that the labours of the Commission should be divided into six parts, representing climacteric groups of departments, but, on examination, this arrangement has been found insufficient, and the divisions, or groups, have been increased to twenty-eight, so that each branch of the inquiry will only include three or four departments. The interrogatories now issued are 161 in number, and if the answers given meet the views of the commission, a vast amount of valuable information will be obtained. The questions are ranged in five divisions, as follows:—

1. General conditions of agricultural production—State of agricultural property—Mode of working—Transmission of property—Conditions of holding—Capital, and means of credit—Wages and salaries—Manure, and improvements—Other costs of cultivation.

2. Special conditions of agricultural production—Methods of cultivation—Waste land—Reclamation—Drainage—Irrigation—Meadow-land and forage—Animals—Cereals—Alimentary products, not cereals—Industrial agriculture—Sugar and spirits—The Vine—Fruit-trees—Silk-worm culture—Proportion of breadth of land and products cultivated.

3. Circulation and placing of agricultural products—Markets.

4. Legislation—Local regulations—Treaties of commerce.

5. General questions.

It is well known that the appointment of this important Commission was caused by the reiterated complaints of distress by farmers and others, and to a considerable extent also by the strong feeling still entertained in the agricultural districts of France against any approach to free trade. The minute subdivision of land and the consequent want of capital as regards the great mass of the farming population, render this question a peculiarly difficult one in France, and it is to be hoped that the inquiry in question will have the effect of removing many errors, and laying the foundation of a real knowledge of

the condition of the agricultural population, always difficult of attainment.

THE AGRICULTURAL RESOURCES OF ITALY.

The following is taken from an Italian source:—

The agricultural industry of Italy is much inferior to that of other countries, as may be seen from the following comparison:—

The superficial area of Italy consists of 30 millions of hectares,* or 74 million acres, thus distributed:—

Land cultivated	14,589,559
Woods	4,835,529
Pastures	6,717,939
Marshes and unproductive stagnant water	4,717,746
Total hectares	30,860,773

At present the proportion of cultivated to uncultivated land is as follows:—

14	to	30	in	Italy.
14	„	15	„	England.
34	„	53	„	France.

The proportion of the produce of cultivated land in various countries is per hectare—

In Belgium	281 francs
„ England	215 „
„ France	176 „
„ Italy, part irrigated	156 „
„ „ unirrigated	78 „

It is calculated that the total value of agricultural produce amounts—

	francs.
In England	4,500 millions.
„ France	5,000 „
„ Italy	2,350 „

The reason of this difference between the agricultural produce of Italy and that of other countries is that they have greater capital and machinery at command.

The spirit of enterprise and the application of artificial resources make it increase elsewhere with surprising rapidity, but in Italy it stands still, with a little increase in irrigation, carried on with a small amount of stock, with few machines, and with little prospect of immediate improvement.

In some countries agricultural industry has recently made great progress. In the western provinces of the United States, in the last two years, there have been in cultivation 25,145,000 acres, equal to about 10¼ millions of hectares of land. The city of Chicago, a few years ago a small Indian village, now contains 250,000 inhabitants, is magnificently built, and its granaries are capable of containing more than three million hectolitres of grain. And to give an adequate idea of the gigantic increase of the products and trade of the neighbourhood of this city, it is enough to mention that, whilst in 1838 there were only exported 78 bushels of grain, in 1864 there were taken out of the granaries 47,124,491 bushels of grain, equal to about 17½ millions of hectolitres†, besides 290,000 barrels of flour.

The production of grain in the United States has reached such vast proportions that it has already had a sensible effect on cereals in Europe. England and France, which imported large quantities of grain nearly exclusively from the Black Sea and Baltic for some years, take a good part of their provisions from the United States, and only in 1865 imported 15 millions hectolitres, to the value of 300 millions of francs, without calculating flour and American spirits, an article obtained by the distillation of grain, of which there are immense works at Bordeaux, Marseilles, Genoa, and in the ports in the Levant.

* A hectare = 2·49 acres.
† A hectolitre = 2¾ bushels.

Besides producing a great quantity, the Americans of the United States can produce it with less expense than the countries of Europe. Ploughing by steam, sowing by steam, reaping and threshing by steam, with their machines five men do the same work that 45 men in Italy do without them. The grain at Chicago costs a little more than 5 francs per hectolitre, and as much again the freight to Liverpool, and if the production of it increases in like proportion as that of late years, before long the markets not only of England and France, but also those of Italy, will be inundated with American grain and flour. It also must be remembered that in the United States the production is sustained by credit founded on the numerous banks.

It is truly deplorable that, in comparison with the recent progress of agriculture in other countries, Italy, a traditionally agricultural country, should remain so much behind, also that her position has become worse.

The cryptogamous disease of the silkworm having decimated the two most profitable harvests of agricultural industry of the peninsula, it is a fact that our produce is in a worse condition than it was twenty years ago.

An examination in detail of the principal products will convince us more as to the agricultural inferiority of Italy.

Generally speaking, the most important product in Europe is that of cereals, and of that the first is wheat. From the best statistical data that we have is deduced the following table of the annual produce of wheat in the various European states:—

	Hectolitres.
Italy	35,000,000
France	90,000,000
Great Britain	38,060,000
Belgium	4,000,000
Prussia	8,000,000
Spain	18,000,000
Russia	80,000,000

It will be seen, then, that Italy, taking into account her territorial extent, her population, and the fertility of her soil, produces less wheat than other countries.

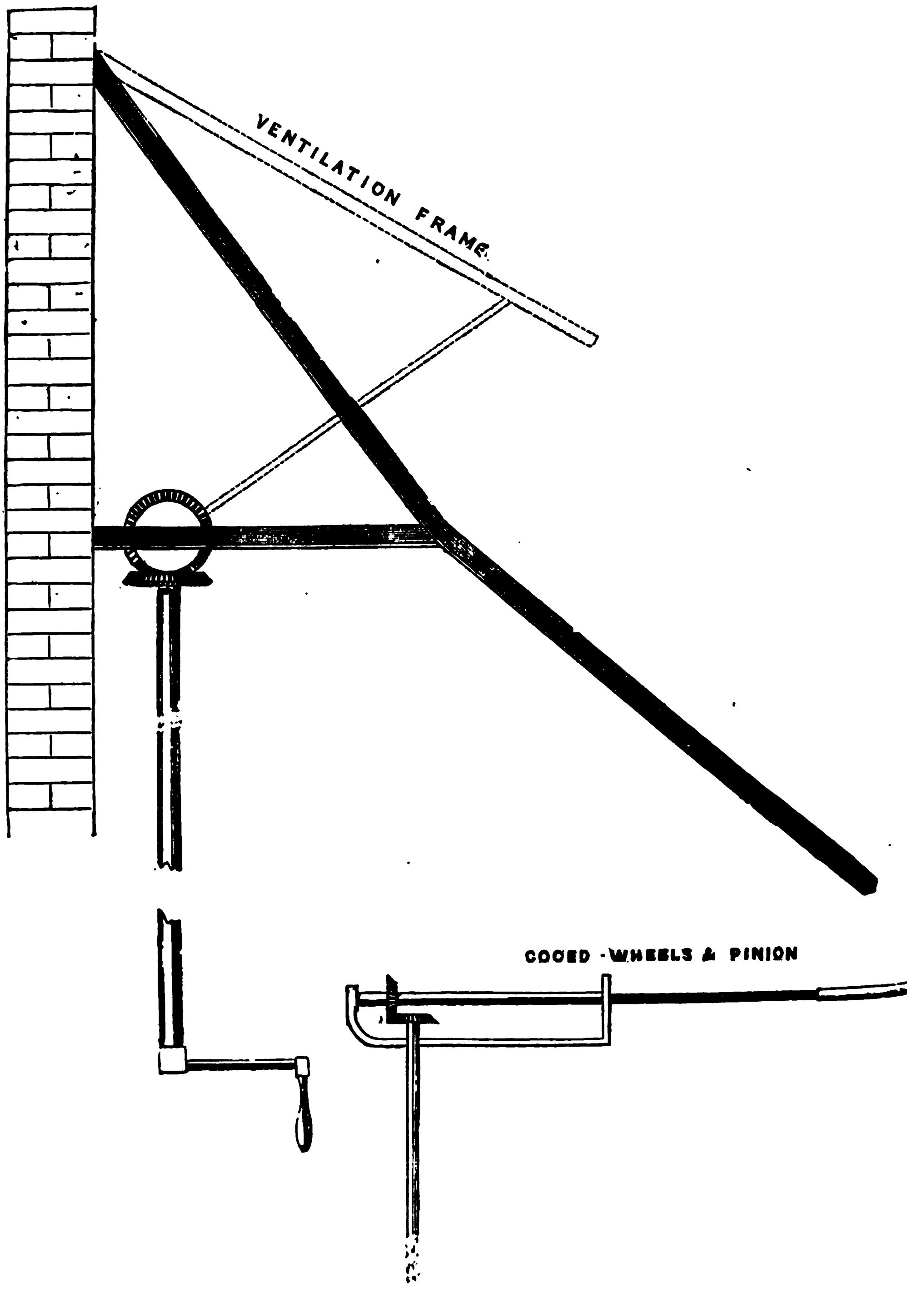
A product that should be named among the principal sources of wealth of the peninsula is wine, the annual crop of which amounts to 28,000,000 hectolitres (616,000,000 gallons) at least, of various qualities; but our wine-growers are still far from comparison with those of France and Spain, and the exportation of this product is limited to a little over 200,000 hectolitres, of the approximate value of 5,000,000 francs, while France, which produces about 40,000,000 hects., exports 4,000,000, to the value of 280,000,000 francs, and Spain, which produces 20,000,000 hectolitres of wine, exports 250,000, to the value of 12,000,000 francs.

Amongst the agricultural products, and, at the same time, an industrial product, of Italy, silk comes, perhaps, first, calculated from 2,000,000 to 3,000,000 kilogrammes, the statistical data to this effect being very deficient and contradictory. In the last ten years, however, the disease of the silkworm has occasioned a great diminution in the collection of cocoons, and hence a great impoverishment in the silk districts. Ascribing the evil to the quality of eggs, the farmers make large provision of foreign ones, at no slight expense, but the result does not correspond with the expectation, the produce, instead of increasing presents a further diminution, and the acquisition of foreign eggs that succeed badly, still further impoverishes their means.

BEARD'S SYSTEM OF VENTILATION.

The following is a description of the system of ventilation, for which a prize of £5, given by the Society of Arts, was awarded to Messrs. Sanders, Frewen, and Co., at the International Horticultural Exhibition:*—

* See present vol. of *Journal*, p. 577, class 231 D.



BEARD'S VENTILATION FOR GREENHOUSES.

In this system one set of the lights that constitute the entilators are placed on the ground level, and the other t the highest part of the building, it being the inventor's pinion that in many hothouses and other buildings more han one-third of the atmosphere continues unchanged, wing to the air being admitted at too high an elevation. 'his evil is believed to be cured when the fresh air is dmitted at the ground line, where in hothouses the eating apparatus is generally placed, consequently the icoming air will be warmed in its passage before it eaches the plants. Another advantage of this method s said to be the power of admitting the fresh and dis-harging the impure air during wet weather without llowing the entrance of the rain. This can either be one by placing the ventilating lights in the back wall r by raising them above the general angle of the roof. 'he higher the angle of the ventilator is raised above the oof the further the ventilator can be opened without dmitting the rain.

The principal merit in this mode of ventilation is he facility and rapidity with which the ventilators are pened and closed. Any amount of air, from a quarter f an inch to one foot or more, can be given along the ntire length of a building very quickly and easily. The echanical arrangement for this purpose consists of a orizontal travelling rod, furnished with arms attached the ventilators. One end of this rod is furnished ith an endless screw, working in a moveable socket, in a xed frame. This socket is turned by a pair of bevilled heels attached to a spindle, descending vertically from he travelling bar. The travelling bar or rod is supported n friction rollers, and the entire weight of the lights and he chief force of the motive power rest upon the screws, that the handle on the end of the spindle can be urned and the lights opened with the greatest ease. 'he accompanying cut explains the arrangement.

Manufactures.

Lucifer Match Factory. — The Frankfort (N. Y.) atch factory is noted for the wonderful and curious ma-hinery used in the manufacture, the invention of Mr. ates, and is probably one of the most perfect manufac-ories of its kind in the world. Some idea may be had of he amount of work done at this establishment when t is known that 720,000 feet of pine, of the best quality, re used annually for the matches, and 400,000 feet of ass-wood for cases. The sulphur used annually for the natches is 400 barrels, and the phosphorus is 9,600lbs. The machines run night and day, and 300 hands are mployed at the works. It takes 500lbs. of paper per lay to make the light small boxes for holding the natches, and four tons of pasteboard per week for the arger boxes; 66lbs. of flour per day is used for paste, nd the penny stamp required by Government on the oxes amount to the snug little sum of 1,440 dollars per lay. There are four machines in use for cutting, dip-ing, and delivering the matches. The two-inch pine lank is sawed up the length of the match, which is $2\frac{1}{4}$ nches. These go into the machine for cutting, where, t every stroke twelve matches are cut, and by the suc-eeding stroke pushed into slats arranged on a double hain 250 feet long, which carries them to the sulphur vat, and from thence to the phosphorus vat, and thus across the room and back, returning them at a point just in front of the cutting-machine, and where they are de-livered in their natural order, and are gathered up by a boy into trays, and sent to the packing-room. Thus 1,000 gross, or 144,000 small boxes of matches are made per day. The machines for making the small, thin paper boxes and their covers are quite as wonderful and ingeniously contrived as those that make the matches. A long coil of paper, as wide as the box is long, revolves on a wheel, one end being in the machine. It first passes through rollers, where the printing is done, from thence to the paste-boxes, where the sides and ends only are pasted; from thence to the folding-apparatus, where the ends are nicely folded, and the whole box is pasted together and drops into a basket. A similar ma-chine is at work at the covers, and thus 144,000 boxes per day are manufactured.

Silver.—Silver Peak is believed to be as pre-eminent over all silver mountains as the Iron Mountain of Missouri is superior to all other iron deposits. Silver Peak is situated east of San Francisco, on the eastern side of the Sierra Nevada, and nearly one degree south of the city of Austin. It is some two miles from Castle Mount, an old extinct crater, about 5,000 feet above ocean level. Near Silver Peak is an extensive deposit of salt, and not far distant a hill of pure sulphur. The whole country has a naked appearance, being quite destitute of vegetation, and bristles with mountains scattered over a plain of great extent. The dreaded "Valley of Death," upon the plains of which, along the "old Spanish trail," travellers have suffered so much, lies but a short distance to the south-east of the crater of Silver Peak. Little Salt Lake, in Southern Utah, lies directly east of Silver Peak. At first the searchers after deposits of the precious metals confined their searches to the Pacific side of the Sierra Nevada, but discoveries in New Mexico, Arizona, and Virginia City induced a thorough examination of the east side of the Sierra Nevada. This resulted in great success, the most brilliant of which is found in the neighbourhood of Austin, on the line of the great overland mail, where a city has sprung up within three years, which Senator Nye says contains a population of 10,000. From along this line of exploration, the miners are rapidly extending their operations, both north and south. Recently (within six months) they came upon this immense deposit near Castle Mount. Twelve exceedingly rich lodes, or "ledges," as the miners call them, were discovered on that single mountain. This discovery in an unexpected region is believed to be the most valuable yet developed. A new deposit, superior even to the Comstock lode, which has furnished so many millions of silver, is about to pour into our market its limitless supply of this pre-cious metal.

Wood Paper.—The constantly increasing price of rags has led paper-makers for some years past to turn their attention to the discovery of other materials suit-able for paper stock. All kinds of plants, from those which grow near our own door to the luxuriant growths of tropical regions, have been experimented on with but partial success; but it now seems probable that for the future our main source of supply will be the forest. It is at least a century, and we do not know how much longer ago, since paper was made experimentally from wood; and, notwithstanding repeated improvements, the requirements of cost and quality have not until recently been met. The manufacture of wood paper is now, however, an accomplished fact. There are two large establishments, near Philadelphia, where it is carried on. In one of these a paper containing 60 per cent. of wood pulp is turned out, and in the other, which is on an immense scale, an excellent paper for printing pur-posed, composed of 80 per cent. wood and 20 per cent. straw, is made. The larger and more successful estab-lishment is capable of turning out from 24,000 to 30,000 lbs. of pulp daily.

The Cotton Crop in the United States. — Dr. Forbes, the Cotton Commissioner of the India Govern-ment, was deputed about two months since to visit the cotton-producing States of America, and after a tour through the whole of them, with the exception of Texas, he has now completed his report. His opinion differs from the impressions thus far current in the Northern States, and is unfavourable as to the probable result of the crop. He proceeded through Virginia into the Caro-linas, North and South, whence he subsequently passed through Georgia, Alabama, Louisiana, Mississippi, Ar-kansas and Tennessee. In North Carolina he found

that little had been sown this year. In South Carolina, where, as regarded care in cultivation, the symptoms were better than in any of the other states, he estimates the sowing to have been not more than a third of the usual quantity. The estimated production of the two States was not over 100,000 bales. In Georgia the condition was much worse, the plants being stunted and choked with grass, which in many places had overtopped them. The assigned causes of the failure were scarcity of good seed, much of that which had been used having been from damaged cotton grown before the war, and scarcity of labour. Originally it was expected this State would yield 250,000 bales, but Dr. Forbes expresses a conviction that 150,000 will be the limit. In Alabama the cultivation seemed better, and there were apparently fewer failures from bad seed; but in some of the best districts floods and rains have destroyed all prospect of a crop, and the estimate for this state, which before the war used to contribute nearly a million of bales, is now under 200,000. As regards the states watered by the Mississippi—Louisiana, Mississippi, Arkansas, and Tennessee—the desolation from the war was found to be complete. For hundreds of miles along the course of the river scarcely a planter's house or establishment, with the exception of the slave quarters, which have been mostly deserted, had been spared. In what is known as the upland cultivation there was a large proportion of cotton compared with other crops, but grass and weeds were universally gaining the supremacy. The consequence is that these four states, which formerly raised in the aggregate 2,600,000 bales, will now, it is believed, not give more than 550,000. It seems to be generally admitted that not more than half the number of the negroes employed in the cotton fields before the war have this year been at work, and that the labour of each man under freedom has not been two-thirds of its former value. Dr. Forbes did not visit Texas, but from that state he heard that, although the cotton crop would be deficient, owing to the lateness of the season, they were better off for labour there than in the other sections of the country. Taking the most favourable view he is able to form, the conclusion to which Dr. Forbes finds himself forced is that from all the states, including Texas, the aggregate yield this year will not be more than 1,200,000 bales, and, looking at the home demand for the supply of the Northern manufactories, he thinks it would be vain to calculate on their being more than 200,000 or 300,000 bales available for exportation. He does not lose sight of the fact that estimates of a much more favourable character have been circulated, both in the North and South, by parties too respectable to be suspected of the slighest intentional misrepresentation, but it is said that the planters who stood in urgent need of advances from the New York houses at the commencement of the season gave the best possible reports of the prospects of the crop, which, indeed, were then not altogether unwarranted, and that it is to subsequent circumstances that the entire change of condition is to be attributed.

MAGNESIUM LAMP.—At the *soirées* of the British Association, at Nottingham, the large refreshment annexe was lighted by two magnesium lamps of a novel character, the invention of Mr. H. Larkin. The distinguishing peculiarity of these lamps (which may be variously arranged to suit widely different purposes) is, that they burn magnesium in the form of powder or filings, instead of ribbon or wire; and that they do not depend on clockwork or any similar extraneous motive-power for their action. The metallic powder is contained in a large reservoir, having a small orifice at the bottom through which the powder falls simply by its own gravity, like sand in an hour glass. In order that a sufficient orifice may be used, and to facilitate the steady flow of the powder, it is mixed with a quantity of fine sand or other diluting material; the proportion of powder to sand being varied according to the amount of light required. After leaving the orifice of the reservoir the stream of metallic powder and sand falls freely through a metal tube, into the upper end of which a small stream of ordinary gas is also introduced. The mingled streams of powder and of gas thus flow down the tube and escape together at its mouth, where they are ignited, and continue burning with a brilliant flame as long as the supply of gas and metal is maintained. At the metal becomes consumed, the sand with which it was mixed falls harmless into a receptacle provided for it, while the fumes are entirely carried away by a small tube-chimney into the outer atmosphere. Immediately below the orifice of the reservoir there is a valve, to either regulate the quantity or entirely arrest the flow of the metallic powder, which valve may be opened and shut at pleasure. When it is desired to light the lamp, the gas is first turned on, just sufficiently to produce a small jet at the mouth of the tube, which small jet being once kindled may be allowed to burn any convenient time, until the moment the magnesium light is required. All that is then needed is to turn on the metallic powder, which instantly descends and becomes ignited as it passes through the burning gas. This action, of turning on and off the metallic powder, may be repeated without putting out the gas, as often and as quickly as desired; so that, in addition to the ordinary purpose to which lamps are applied, an instant or an intermittent light of great brilliancy, suitable for signals or for lighthouses, may be very simply produced with certainty of effect and without the smallest waste of metal. The first evening an objection was made that the blue tone of the light created a cold and somewhat ghastly effect. On the second occasion Mr. Larkin remedied this by mixing with the magnesium a certain quantity of nitrate of strontia.

CULTIVATION OF COTTON.—At a recent meeting of the executive committee of the Cotton Supply Association, a letter was read from Lima, Peru, advising the despatch of a bale of cotton, grown from seed sent out by the association, and stating that the grower has two plantations with above 900,000 plants of Peruvian cotton, and is still extending his operations. He expects shortly to have a large quantity of land sown with exotic seed. Cotton cultivation is receiving increased attention, favourable and profitable results having been obtained, and there is every probability that Peru will in a few years become a large cotton-producing country. Consular reports, forwarded by the Foreign-office, were received from Crete, Rhodes, Bagdad, and Bogota, upon the cultivation of cotton in those districts. In the island of Crete the growth of cotton has hitherto made but little progress. The quantity obtained last year was about one thousand cwts., but no satisfactory estimate can yet be formed of the present year's crop. Complaints are made of the restrictive tendency of Turkish law in regard to foreign colonisation. Looking at the last tracts of rich land now lying waste for want of labour, the general salubrity of the climate, and the admirable geographical position of Crete, it is believed that if the disabilities on the tenure of real property by Europeans were removed, they would soon, by their enterprize and skill, give a fresh impulse to commerce and agriculture, and that the cultivation of cotton would rapidly increase. In the vice-consular district of Candia 3,000 cwts. of clean cotton were grown in 1865, and it is estimated that the crop this year will yield about the same quantity. The production might be increased by a diminution of taxes and duties, and by improved agricultural implements. In the province of Retimo very little cotton is grown and barely sufficient for local use. In the island of Cos about 1,200 cwts. of cotton were grown in 1865, and it is not expected that this year's crop will exceed that quantity. Owing to the oidium which has attacked the vine plantations and nearly destroyed them, the cultivators can scarcely obtain a livelihood, and it is presumed that they would the more readily betake themselves to cotton. The only hindrance is the want of money; and if the

peasants could procure advances on cotton crops, at a reasonable rate of interest, the cultivation of this article would soon become the only occupation of the agricultural population of Cos. The cotton grown in Turkish Arabia is inadequate to the demand for local consumption, the deficiency being supplied by importation from Persia. The quantity produced in Busreh in 1865 was about 6,000 lbs. of clean cotton, and probably as much will be grown this year. In the pashalic of Moossul about 3,500 acres have been planted with cotton during each of the last three years, but the ravages of locusts have been very great, and the cultivators have suffered immensely. If there were no locusts the produce would be about 300,000 maunds of 18lbs. each, or 18,000 bales of 300lbs. each. In the United States of Colombia, between latitude 3 deg. and 5 deg. North, on the banks of the river Magdalena, some experiments have been made with American seed, but they have not been extended, as tobacco and other agricultural products are found to be more remunerative. A small bag of excellent cotton was received from Rio Grande do Sul, grown from Sea Island seed sent out by the association, and it was resolved to comply with an application which has been made for a further quantity of seed. The experiments already made are encouraging growers to go into the cultivation of cotton upon a larger scale, and a considerable extent of land will be planted this sowing season.

Commerce.

POTATO SUGAR.—A bushel of potatoes weighs about 60 lbs., and gives 8 lbs. of pure, fine, dry starch. This amount of starch will make five pints of sugar, of the weight of nearly twelve pounds to the gallon, equal to 7½ lbs. to the bushel of potatoes, or a little less than a pound of sugar to the pound of starch. The sugar is not as sweet as the muscovado sugar, nor is it actually as sweet as its taste would indicate. The sugar may, however, be used for many kinds of domestic purposes. It ferments with great liveliness and spirit when made into beer, yielding a healthful and delicious beverage, and on distillation a fine cider brandy flavoured spirit. It would, however, be most useful in making sweatmeats, and may be used upon the table in lieu of honey, for which it is a good substitute. It has already become a favourite with most people who have become acquainted with it. Its taste is that of a delicious sweet.

ITALIAN PAPER.—Paper is an important article of manufacture in the district of Genoa. In 1865 the export was considerably above the average, having amounted to nearly five million pounds. It is chiefly shipped to Mexico and South America, where the Spaniards use it largely for cigarettes, and it is preferred to machine made paper.

RICE IN MADRAS.—In a recent number of the *Madras Times*, the following account relative to the experimental cultivation of Carolina rice in Madras is given:—The collector of Tinnevelly has reported to Government that two Tinnevelly measures = 1$\frac{7}{13}$ Madras measures of Carolina rice, were sworn on the 20th September, 1865, in the best quality of channel-irrigated land, in the Oorkad estate, which bears the heaviest crops in his district, at present under the Circar management; the land was also manured, but the yield on the 9th February was only one mercal, seven Tinnevelly measures, or 10¾ Madras measures, giving only seven and a half fold, whereas the indigenous "Anikomban," or ivory rice, yields in the same locality twenty-one fold. This was seed of 1865, saved from the crop of the preceding year. There is no reason alleged for the yield being so inadequate; the crops in the locality have been good. The soil is sandy clay, improved by manure and irrigation, and may perhaps not be adapted to this species of rice. It is suggested that when exotic grain is forwarded for trial, it would be advantageous if the description of soil on which it arrives at perfection were stated, in order that, if possible, similar soils might be selected. The collector of South Arcot has been requested to forward to the collector of Tinnevelly full details of the highly successful experiment lately conducted in the South Arcot sub-division, in order that, if possible, the cause of comparative failure in Tinnevelly may be detected. Now that a large supply of Carolina seed rice is expected from the Secretary of State, it is very important that risk of failure in growing it should be guarded against as far as possible. Details of the system of cultivation pursued in America would be very valuable, and probably easily procurable.

BRICK TEA.—The manufacture of brick tea, which is so important to all hill planters in India, has been very successful. Mr. McIver, the manager of the Kousanie Tea Company, Almora, has for several seasons succeeded in preparing it in perfection by means of machinery which he himself devised. The specimens which he exhibited in Lahore, Lucknow, and the London market, met with marked approbation from the most competent judges. It is made of the purest China tea, grown on the Himalayan slopes, well cemented, and hardened into a form like that of an ordinary tiled flooring, but three times thicker. So solid is it that a hatchet is required to cut it, and the tea made from it is quite equal in flavour to the finest mixture produced. More important than this is the success with which these bricks have been introduced into the marts of Central Asia by Cashmere and Afghan traders. The Kumaon planters, with an energy not surpassed by those of Assam and Kangra, lately deputed Mr. Lyall, one of their number, to undertake the overland journey to Russia through Central Asia, so as to develope a trade in Himalayan teas. The bricks are of such a shape and weight that two of them can be slung over a sheep or goat, the usual way of carrying merchandise over the snowy range.

SUGAR IN THE UNITED STATES.—The average monthly consumption of sugar in the United States during the first seven month of the current year appears, from Mr. H. E. Moring's *Circular* for August, to be 31,120 tons, against 28,918 tons in 1865, and 20,352 tons in 1864. The total amount of deliveries for consumption during this period is 217,842 tons this year, against 202,424 tons in 1865, and 142,466 tons in 1864. There is also an increase in the imports for the same period, the quantities being 289,298 tons, 251,236 tons, and 188,324 tons during the first seven months of the years 1866, 1865, 1864, respectively. The stock on the 1st of August in the four principal ports of the United States was 160,912 tons, against 118,934 tons in 1865, 98,395 tons in 1864, and 82,985 tons in 1863.

Publications Issued.

THE RESOURCES, PRODUCTS, AND INDUSTRIAL HISTORY OF BIRMINGHAM AND THE MIDLAND HARDWARE DISTRICT. Edited by S. Timmins. *(Robert Hardwicke.)* That which was done for the industries of the Tyne, Wear, and Tees, on the occasion of the meeting of the British Association at Newcastle-on-Tyne, has now been done for the Industries of Birmingham and the Midland Hardware District, in connection with the meeting of the Association held in that town last year. The work was issued at the Nottingham meeting just concluded, and contains a complete account of the origin, history, progress, and present condition of the various branches of trade or manufacture treated of. The work extends to upwards of 700 pages octavo, is uniform in size with the annually published volume of the Transactions of the Association. Seven of the reports deal with the mineralogical treasures of South Staffordshire—in its coal, iron, and lime; a

valuable report on the iron-trade—locks and lock-making; cast iron—hollow-ware; the Wolverhampton and Walsall trades, and the ceramic manufactures of Staffordshire; the glass trades of the town and district; the manufacture of soap and red lead, lighthouse illumination, the manufacture of alkalies and acids; the ribbons and watches of Coventry; the needles and fish-hooks of Redditch; the Industrial History of Birmingham, by the editor, Mr. S. Timmins—Brass, and brass manufactures; statuary by casting and electro-deposition, mediæval metal working, papier-maché and coffin furniture, stained glass, the gun-trade, buttons, jewellery and the gilt toy trade, saddlery, the old plated and the modern electro-plated trade, the returns of the assay-office of the town, coining, block paper, rope-making, wire-drawing, the pen trade, the manufacture of iron wood, screws, of wrought iron hinges, cut and hand-made nails, of articles in pewter and Britannia-metal, the manufacture of brass and iron bedsteads, of measuring rules, steel pens, tin-plate and wrought-iron hollow ware, enamelled iron articles, castings in ordinary and malleable iron, of hydraulic, sewing, and nail-making machinery, of swords, bells, roasting-jacks, bellows, fire-irons, fenders, of heavy edge-tools, saws, and planes, of various chemical products, artificial manures, colours, varnishes, and lacquers, &c., with a paper on the Social and Economical Aspects of the Town, and another on its Medical Aspects, the whole wound up with a paper on Coffin Furniture Manufacture, concludes a work which, for the first time, shows the varied products and resources of the midland hardware metropolis in their true importance, locally and nationally, and will do much to elevate the labours of that busy town, wherein are practised a greater number of varied trades and manufactures than in any other manufacturing centre in this or any other country. As a contribution to the industrial literature of our land it is a welcome addition. As an addition to the libraries of Mechanics' Institutions, and Working Men's Clubs, not forgetting Free Libraries, it will be valuable, and it will be received by the industrial educationalists on the Continent with a hearty welcome. The thoroughly practical character of the work is its best recommendation. The reports have been written, collected, and compiled by those who are busily engaged in the trade life of the town; they have, therefore, no claim or pretension to literary merit, but every effort has been made in each department of trade, &c., to obtain statistics of production, number of work people, rate of wages, prices of articles, quantity of raw material, &c., consumed.

Notes.

Acclimatization.—His Excellency the General Khereddin, son-in-law of the Kasnadar of His Highness the Bey of Tunis, has just sent to the Jardin d'Acclimatation in the Bois de Boulogne, a magnificent present of animals that were brought to Paris by one of his servants. It consists of a fawn of the deer of Barbary, three goats to supply it with milk, six gazelles, a fox, a jackal, and several birds, amongst which may be named—a superb ostrich, a bustard, two wild pigeons, three falcons, trained to fly at hares, two sparrowhawks, trained to fly at quails, an eagle, a yellow vulture, &c. The eagle and the vulture were offered to the Museum of Natural History in the name of His Excellency the General Khereddin. The falcons and sparrowhawks have been placed in the hands of M. Barr, the able falconer of M. Alfred Werlé, of Rheims, who will put them into training, and try their capabilities in the plains of the Camp of Chalôns, and compare their acquirements with the birds of his own training. This handsome present of the General Khereddin is a fresh proof of the interest that this high Tunisian dignitary takes in European matters. His taste for flowers and animals enables him to make a judicious use of his great fortune in spreading a knowledge of useful and remarkable objects. The General Khereddin has recently made a European Garden at Tunis; and M. de Grandmont, who has had an opportunity of seeing it, has, in a recent communication to the Société Impériale d'Acclimatation, stated that the ingenious arrangement of this splendid garden, and the happy mixture of European ornaments and Moorish fountains, could not be too highly praised.

The Food of Paris.—The following details will be interesting, not only to the trader and producer, but also to the consumer. It was estimated in 1860 that 13,460,794 kilogrammes of butchers' and pork butchers' meat were sold in the Halles-Centrals of Paris; 13,000,000 salt water and 1,193,000 of freshwater fish; 8,900,000 kilogrammes of butter; 192,000,000 kilogrammes of eggs; and 2,212,000 kilogrammes of cheese; the total corresponding to about the value of 64,000,000 of francs, or £2,560,000 sterling. The sale of fruit, vegetables, and bread amounted to 54,000,000 francs, making a total of 118,000,000 francs, or £4,720,000 sterling. The quantity of bread sold was 7,000,000 kilogrammes; and that of wheat and flour was 1,433,739 quintals.

Horseflesh as Food.—The consumption of horseflesh in Paris increases rapidly. It is scarcely two months since the sale of this new kind of food was officially authorised, and already a second special butcher's shop has been opened in Paris (Rue de Flandre, 12) under the surveillance of a veterinary inspector appointed by the Government. At another part an establishment for boiled horse-flesh and soup has been opened in the Quartre St. Antoine (Rue St. Marguerite, 26), and a manufactory of horse-flesh sausages will be opened in the Avenue de Clichy, 101.

American Fire Brigade.—One of the most remarkable and meritorious institutions of the city of Baltimore is the Fire Department. Ten years ago, under the volunteer system, which, singular to say, still holds good in some parts of the country, the town was notorious for the frequency of its fires, and the scenes of violence and lawlessness which attended them. The present department consists of six steam fire-engines, drawn by two horses, and worked by thirteen men, each accompanied by a tender, carrying wood, and a drum, drawn by one horse, on which is wound the hose. There are also two hook and ladder companies. The whole annual expense of this establishment is about £13,000. But one of the most potent adjuncts of the department is the fire-alarm telegraph. This is a wire which runs through the city, and is connected with some ninety signal stations. These stations are cast-iron boxes on a post, of which a key is kept at the nearest house. Every policeman is, in addition, provided with one. On opening the box a crank is seen, by turning which a bell is rung at the central station, and the number of the box from whence the alarm is sent is recorded by an "improved Morse Register." The operator immediately communicates the number of the district where the fire has broken out to every engine-house, and four engines, with fires lighted and men equipped, can be started in two minutes from the time of an alarm being struck. An instance is on record of an engine being at a fire three-quarters of a mile from its house, ready to go to work in six minutes from the time the crank was turned. The following shows the diminution that has taken place in the rates of insurance, per hundred dollars.

	1850. c.	1860. c.
Dry Goods	65	40
Hardware	75	50
First Class Dwellings	30	25
Furniture in Dwellings	50	40
Wholesale Groceries	65	40
Liquors in Casks and Glass	75	50
Warehouses (Storages)	65	40

102 actual fires occurred during 1864, involving a loss of 169,566 dollars, on which there were insurances amounting to 142,954 dollars. The four principal fires, with a loss of 54,209 dollars, were respectively three coal oil factories and an Italian brig in the harbour laden with that article. Many of the minor fires also occurred from the use of this article in lamps. It appears to be the practice to adulterate coal-oil with benzine, which at a temperature of 80 degrees turns into gas, bursting the lamp, and igniting the inflammable substance. While pure oil costs one dollar the gallon, the adulterated oil can be sold at 70 cents. Purchasers can easily test the oil by pouring a small quantity into a saucer, and applying a lighted match to it. If pure, it will be found very difficult to ignite, but if adulterated it will very readily catch fire, and should be rejected.

THE SILKWORM DISEASE.—M. Pasteur recently communicated to the Academy of Sciences, his researches on the disease of the silkworm, undertaken by him at the request of the Minister of Agriculture and Commerce. His first care was to examine the peculiar black spots which seem to be characteristic of the disease, and which have been called vibrating corpuscles; and he arrives at the conclusion that although the corpuscle is undoubtedly a symptom of the disease, the silkworm may be in an unhealthy state without it. There may be no corpuscles in the seed, none in the worm when just hatched, nor in the chrysalis, and yet the butterfly may be affected with them; and in that case we may safely conclude that it has caught the disease during the rearing, and that it is not hereditary. It is quite certain that healthy seed can only proceed from non-corpusculous butterflies. But all seed proceeding from corpusculous parents is not necessarily bad in a commercial point of view, for it may yield a remunerating quantity of silk, though it would not do for breeding. Nay, even a diseased seed may produce butterflies in a perfectly healthy state; this result, M. Pasteur believes, may be attained by observing great cleanliness, and carefully removing the carcases of the dead worms. In order to see whether a lot of cocoons are likely to give good seed, M. Pasteur takes away a few twigs, containing in all about 100 cocoons, and puts them into a room apart, kept at a temperature of a few degrees more than that of the whole lot. In this way the butterflies get out sooner, and may be examined under the microscope. If these are not corpusculous, then the lot may be relied on for breeding purposes; if they are, it should be taken to the spinning factory for the sale of the silk. Corpuscles abound in the dust of the rooms where diseased silkworms have been reared, and if the mulberry leaves which are given to the worms be sprinkled with this dust a great mortality will ensue. And yet the worm. that die of this food have no corpuscles. In fine, Ms Pasteur is of opinion that the disease has always existed, and that it is now only in a state of great development owing probably to great mismanagement.

THE NEW RAILWAY SECURITIES ACT.—The Act to amend the law relating to securities issued by railway companies has been printed. Every railway company, on or before the 15th January next, is to register, and to keep registered at the office of the Joint Stock Companies in England, the name of their secretary, accountant, treasurer, or chief cashier for the time being authorised by them to sign instruments under this Act. The half-years for the purposes of the Act to be the 30th June and 31st December, and the first half-year next December, but the Board of Trade on application may appoint other days. Within 14 days after the end of each half-year every railway company is to make an account of their loan capital authorised to be raised, and actually raised, up to the end of the half-year, specifying the particulars described in the schedule. The Board of Trade may prescribe the form in which the half-yearly accounts are to be made, and such accounts are to be opened to the inspection of shareholders, &c., without payment. Within 21 days of the end of each half-year every railway company is to deposit with the Registrar of Joint-Stock Companies in England a copy, certified and signed by the company's registered officer as a true copy, of their loan capital half-yearly account. Railway companies are prevented from borrowing until the accounts stated are rendered, and on a company failing to register or deposit the half-yearly account, a penalty not exceeding £20 is to be imposed, and £5 for every day during which the same continues after the day on which the first penalty is incurred. Any person may inspect the documents on the payment of 1s., and have extracts furnished. There are penalties set forth for false declaration. On conviction of a director or officer by indictment there may be a fine or imprisonment, but on a summary conviction, a penalty.

PARIS IMPROVEMENT.—The day of the Imperial *fêtes*, the 15th of August, was marked this year by the temporary opening of one of the most remarkable improvements which has yet been made in Paris, the grand esplanade to be known in future as the Place du Roi de Rome. The hill known as the Trocadero, on which Napoleon I. proposed to erect a palace for his son, the King of Rome, stood on the road between Paris and Passy, on the opposite side of the Seine to the Champ de Mars; in less than six months this hill has been converted into a sloping esplanade, a work which necessitated the excavation and conveying to a considerable distance more than half a million cubic yards of stony soil. The greater portion of the *débris* was carried by rail over the river by the Pont de Jena, and served to raise the level of the ground of the Champ de Mars, to prepare it for the Great Exhibition of next year, the rest was employed for the earth-work of the railway which is now being formed to complete the circular line around Paris. The work was commenced on the 28th of January, and finished, as regards the first portion, on the 7th of July, and before the 15th of August the whole of the stuff excavated was carried away, the railway over the river removed, and the bridge replaced in its ordinary condition. The works have, however, recommenced, it having been determined to double the extent of the new esplanade; the excavations now to be undertaken are nearly of the same extent as those finished, but with this essential difference, that the *débris* will not have to be conveyed off the ground, or only to a very short distances. The new esplanade, when completed, will be nearly circular, and more than eight hundred feet in diameter. Great changes are being made in the old village of Chaillot, famous for its convents, and the earth excavated will be employed to fill up the old catacombs, which still exist there. The esplanade, or *place*, will be open towards the river, and one section of it will be on an incline, and capable of accommodating, it is said, half a million of people to view the Exhibition and its surrounding park next year, and, in after years, to witness the military and other *fêtes* which take place in the Champ de Mars or the river. The slope, which will be covered with grass, will have an incline, varying from ·03 to ·62 in the 1,000 feet, and across it will be a grand avenue, in the line of the axis of the bridge opposite, 130 feet wide, and disposed partly in steps, two inches high, of which there will be 142, relieved at intervals by landing-places; around the esplanade will be a grand avenue or boulevard, and at the back part a series of villas, and it will be approached by nine roads or boulevards, which will place it in direct communication with the top of the Champs Elysées, the outer boulevards of the city, as well as with Passy and the Bois de Boulogne, and it will command a view of the neighbouring heights of St. Cloud and Meudon.

FEMALE PROFESSIONAL EDUCATION IN FRANCE.—A society for providing professional education for young women founded, about three years ago, two schools in Paris, and the annual distribution of prizes has just taken place. The grand object is to instruct the pupils in some useful occupation without submitting them to the dangers and inconveniences of the workshop, factory, or studio. The course of study includes the French

language, history, geography, arithmetic, accounts, and industrial design, and ateliers for needlework, tailoring, engraving on wood, and painting on porcelain form part of the establishment. The fees are extremely moderate. During the past twelve months 280 pupils attended the two schools, and several who had finished their education have been well placed with the assistance of the lady patronesses of the society. The prizes consist partly in accounts opened at the *caisse d'epargne*, or savings bank, in favour of the successful competitors. Singing is also taught in the school as a recreation, and the distribution of the prizes was enlivened by the performance of several choruses by the pupils. The establishment of these schools is due principally, we believe, to M. Jules Simon and other social economists, whose ladies take an active part in their management.

Artesian Wells in Algeria.—The *Moniteur de l'Algerie* of the 3rd inst., states that great success is attending the sinking of Artesian wells in the Great Desert. Boring works were established at El-Gohard, in Hodua, in the circle of Boussâda, on the 30th of May last, under the direction of M. Jus, the engineer. Water was found at a depth of 9 metres 70 centimetres, which rose to a level of 5 metres below the surface of the soil; at a depth of 90 metres, another sheet of rising water was found; and at 104 metres the borer fell in with another sheet of rising water, affording a supply of 30 litres per minute; and the works having been continued to 137 metres, another sheet of water was tapped, giving a supply of 110 litres per minute. Great results are expected from the establishment of these wells, and a hope is expressed that by their means a time will come when the desert will be transformed into a rich and fertile country.

Sardine Fishery.—The sardine fishery this year has been very successful and profitable. At Douannenez and at Concarneau, which are the principal centres of this fishery, 884 boats have been employed. More than 110 millions of sardines have been caught by them during the month of July. The sale produced 707,648 francs. At the end of August the abundance of sardines was such that they were sold at as low a price at two francs per thousand, a thing that has not been known for ten years.

Beet in America.—*The Grocer*, quoting from a recent number of the *Scientific American*, states that a joint-stock company at Chatsworth, Illinois, have 600 acres of beet growing this year. They estimate the crop at ten tons to the acre, and the yield full 1,000,000lbs. of sugar. The machinery of the company, which is all new, was brought from Germany. The company will commence operations about the 1st of October. If this enterprise proves a success—of which there is not much doubt—the business will be sure to spread with rapidity through that state and the north-west.

Patents.

From Commissioners of Patents' Journal, August 31st.

Grants of Provisional Protection.

Aeriform and other fluids, raising—1997—G. Campbell.
Artificial teeth—1662—T. Godfrey.
Boot-making, implement for—1995—J. H. Johnson.
Boot-making machinery—1964—T. Greenwood and W. Keats.
Cements, concretes, and artificial stone—1970—J. J. Bodmer.
Chlorine-manufacture—1948—W. Weldon.
Collars and wristbands—1954—G. Speight.
Cords, chains, &c., apparatus for holding and releasing—1979—W. Beaumont and W. McMaster.
Corn rick stand and waterproof cover—1991—J. B. Ham.
Digging implement—1974—W. E. Gedge.
Direction labels, damping—2045—W. Hoare.
Dove-tail joints, cutting—2001—S. T. Armstrong.
Dried fruit, removing seeds from—2033—W. R. Lake.
Explosive compound mixture—1940—H. A. Bonneville.
Fibrous materials, spinning and doubling—2037—J. Sibley.
File-cutting—1596—P. H. Limet.
Fire-arms, breech-loading—1960—W. Richards.
Fire-arms, breech-loading, and cartridges—1976—W. Stokes and C. Faulkner.
Fire-escapes—2021—E. Lamb.
Gaseous water, application of to medicine, &c.—1966—A. Paraf.
Gas and water pipes, connections for—2023—R. Medcalf and W. Nicholls.
Gas, artificial materials for producing—2025—J. Hamilton.
Gas-manufacture—1162—A. Upward and A. A. Cochrane.
Giffard injector—1982—J. Robinson.
Hay, corn, &c., ventilating ricks of—2029—E. Lywood.
Human body, apparatus for irrigating parts of—1950—A. V. Mathieu.
Iron-manufacture—1823—J. N. Fournel.
Jars and bottles, securing stoppers of—2007—J. H. Johnson.
Lard, cooling, purifying, and bleaching—2003—N. Kilvert.
Locomotive engine wheels, increasing adhesion to their rails—2015—A. Vescovali.
Mother-of-pearl, imitating—1972—W. E. Gedge.
Motive-power engine—1946—T. Adams.
Nitrogen, substitution of for hydrogen in certain bodies—1956—P. Greiss and H. Caro.
Ores, coal, &c.—1968—J. A. Birkbeck.
Paper pulp, manufacture of from wood, &c.—1980—J. Sawyer and F. Bauman.
Paper-staining—2005—T. Campbell and H. Coffey.
Precipitation and deoxidation—1978—A. Paraf.
Railways, locking switches of—1952—W. Stroudley.
Rein clip or holder—1942—W. Toms.
Rotary engines—1958—W. Clark.
Safes and strong-rooms—1993—I. E. Chillcott.
Sal-ammoniac, producing in a commercial form—2043—P. Spence.
Sewing machines—2017—I. Dimock.
Smelting furnaces, hot blast for—1962—J. Pickering.
Spindles, foot-bearings for—2027—W. R. Lake.
Telegraph wires, insulating—1989—W. A. Marshall.
Torpedoes—2035—C. A. McEvoy.
Umbrellas and parasols—2039—H. Holland.
Winding apparatus—2013—J. Boyd.
Window-blinds, &c., apparatus for lowering and raising—1944—J. W. Hoffman and G. R. Wilson.
Woollen cloths, fulling—2031—W. Bottomley.

Inventions with Complete Specifications Filed.

Fibrous substances, bleaching—2156—G. Haseltine.
Looms—2186—C. Richardson.
Saw for forest use—2170—W. E. Gedge.

Patents Sealed.

595. W. P. Le Keux and F. A. Wishart.	683. J. Norman.
643. R. Walker.	694. G. Price.
665. H. Hackett.	696. A. C. Baldwin.
668. W. H. Berry.	715. V. Duterne.
669. T. Clayton.	796. F. C. Bakewell.
678. E. Rimmel.	922. J. Davis.

From Commissioners of Patents' Journal, September 4th.

Patents Sealed.

676. J. Broadbent.	730. T. Wallwork.
686. A. Barker.	731. C. J. Richardson.
692. W. and S. Machin.	758. L. Kaberry.
693. G. Randle.	808. J. Campbell, S. McKlasty, and T. Wilson.
698. W. Thomson.	827. W. E. Newton.
700. T. Prideaux.	874. A. V. Newton.
703. G. E. Donisthorpe.	1058. T. Gray.
704. S. F. Schoonmaker.	1082. T. Gray.
713. W. H. Fletcher.	1164. W. Clark.
719. E. T. Hughes.	1375. T. Holt.
720. E. T. Hughes.	1619. J. B. Payne.
721. E. Forster.	1779. A. V. Newton.
723. H. T. Humphreys.	

Patents on which the Stamp Duty of £50 has been Paid.

2161. J. H. Banks.	2176. W. Boulton and J. Worthington.
2115. T. Bourne.	283. E. Beanes.
2138. D. Spiers, A. Boyd, and J. Kirkwood.	2192. J. Rowell.
2180. H. A. Bonneville.	2156. J. Snider, jun.
2139. A. Agnew.	2171. E. Alcan.
2158. G. Russell.	

Patents on which the Stamp Duty of £100 has been Paid.

1970. J. H. Johnson.	1993. J. A. Simpson.
2001. W. Brown and S. Bathgate.	2245. M. Gerstenhofer.

Registered Designs.

Metallic pen—Aug. 18—4804—C. Brandauer, Birmingham.
Portable combined holder for scent and other materials—Aug. 21—4805—P. and F. Schofer, 27, Piccadilly.
Apparatus for watering gardens and other like purposes—Aug. 23—4806—C. A. Eade, Birmingham.
The bell cruet—Aug. 24—4807—F. E. Timm and Co., Regent-place, Regent-street, Sheffield.
Floor skate—Sept. 4—4808—E. Woodward, Spon-lane, West Bromwich.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 14, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Proceedings of Institutions.

The South Staffordshire Educational Association.—The following letter has been addressed to the editor of the Birmingham *Daily Post*, by Mr. F. Talbot, the Secretary of this Association:—"It is now nearly seven years since the above Association was established, and you have, from time to time, been good enough to record its operations in your journal, and to call attention to its objects and prospects. But although the work and purpose of the Association have been thus kept before the public, and especially through the agency of the late secretary, Mr. Jones, they have not yet received that attention and support to which, I think, they are fairly entitled. Perhaps, therefore, you will kindly allow me space to state briefly what the Association has attempted to do hitherto in accordance with its title, and to suggest what may possibly be its future programme under more favourable conditions of existence. The Association was established in the beginning of 1860, to give effect to the very admirably devised scheme of annual examinations of the London Society of Arts, and this it does by making known to the Mechanics' and kindred Institutions of the district the provisions of that scheme; by promoting the establishment and instruction of classes of young men who are disposed to take advantage of those provisions; and, finally, by becoming responsible for the proper conducting of the Examinations of the Society at various centres throughout the district. This branch of the work of the Association has met with considerable success. Like all other educational operations in connection with Mechanics' Institutions, this one has recently suffered from various causes, which perhaps it would be difficult to define, but from the commencement of the examinations a large number of young men eave earned the certificates of the Society of Arts, and some have succeeded in carrying off the highest prizes awarded by that Society for the distinguished excellence of their papers. In the first year after its establishment the Association matured, and has since carried out, a scheme for the examination of scholars attending evening schools. It was felt that unless youths were progressively trained from their ordinary school-days in the habit of answering questions upon paper, there would be little hope of that large number of them, which was on all accounts desirable, coming up year by year to the Society of Arts Special Examinations; and it was wisely thought, too, that even if they did not do this, the annual testing of their ordinary acquirements by an examination would be productive of the very best results. For six years this Elementary Examination has been held, and hundreds of boys and several girls have received certificates issued by the Association, indicating the state of their knowledge of Scripture and English history, of arithmetic, geography, and composition; and in the case of girls, of plain needlework, in addition to these subjects. This year, for the first time, the Association has been able to offer a few prizes to the most successful scholars, and the result of this step, both on the character of the examinations and on the number of candidates, according to the report of the examiner, the Rev. Julius Lloyd, seems to be very satisfactory. He says:—'There has been an increase of candidates this year from 122 to 184,' and 'The improvement upon last year's results in the lower grade is decided and considerable.' A Supplementary Examination of more than thirty of the best candidates of the present year will be held in a few days in competition for three prizes, offered by the President of the Association, Lord Lyttelton, and by the Earls of Dartmouth and Lichfield respectively, for the best papers on money matters, animal physiology, and domestic economy. The last for girls only. Another effort of the Association has been directed to the aid of Working Men's Clubs. It has been the medium whereby the Central Working Men's Club Union has operated throughout the district, and through its agent it has been instrumental in disseminating much information as to the objects and plans of these clubs, and in bringing together, on several occasions, large numbers of the friends and supporters of the movement. It has likewise offered to the clubs, as to other Institutions in union with it, all the educational advantages within its power. In aid of all these three classes of Institutions the Association has published annually a list of lectures, which have been offered at a small cost to Institutions, with a view of paying the travelling expenses of the lecturers. These have been, in many instances, of great value to Institutions, but have not been used to that extent which is desirable. There is no doubt, however, that the Association has done well in keeping this branch of operations well before the Institutions of the neighbourhood, and it may be hoped that the issue of a good list in the coming autumn will revive the interest of the public in lectures, as an important and necessary portion of their annual programme. Having thus adverted to the past and present operations of the South Staffordshire Association, allow me to suggest the sort of enlarged scheme which the Association might reasonably entertain, should its funds become, as we may hope they will, adequate to such extension. In the first place the Association should again endeavour to unite the Institutions of the district in some definite course of instruction for their younger members. The day schools are now turning out annually so many well-taught boys and girls, that unless Institutions take up and continue the education thus begun, the effect of much good instruction will certainly be lost. Evening schools can do much towards enabling young persons to retain and perfect their elementary instruction, but they can never become, as institutions can, places for special instruction, either in science or in language. Whether the Association can assist in the establishment and teaching of classes by an agent itinerating through the district for that purpose, as in East Lancashire,; whether it can engage the services of teachers for special subjects in certain districts; or whether it shall simply undertake, as it does now, to conduct examinations every year to test the soundness and extent of the instruction imparted by teachers engaged and paid by the Institutions, are questions that cannot at present be decided. Perhaps the best plan would be for the Association to provide a good board of examiners, who would annually examine all students of classes in Institutions, and certify their attainments and progress, even those of the most humble degree; that it should establish a prize fund to reward those Institutions that bring the largest number of pupils up to a certain standard, and the most industrious pupils by prizes of books or other suitable presents. In this way the Association would act on the same principle as the Government Department of Science and Art, and would not interfere

with those local efforts that must be stimulated into active operation if any real good is to be effected. The gradual enlargement of a library should be, as it generally is, one of the principal objects of an Institution. Something might possibly be done by the Association in this direction. It might publish annually a catalogue of the most useful books published during the year, with cost prices attached; it might publish lists of books which some Institutions might like to exchange for a time with others; it might possibly make arrangements whereby even the smallest Institutions could have their reading-room tables covered with the best serials at less than half-price within a week or two of their publication, and it might do a great service to students of Institutions studying for the Society of Arts by keeping a small library of the best text books for their inspection and reference. In the matter of lectures, however, perhaps the Association could do the greatest good. Taking within its limits, as it does, a large extent of country, it ought to be able to draw from the best educated portions of it stores of knowledge that should be available for others not so favourably circumstanced. It ought to be able to provide annually a long and varied list, and to state all necessary conditions of their delivery. It would be a great thing done for the district if the Association could provide annually for the delivery of a course of lectures, by some eminent man, on mining or metallurgy, or on some other subject similarly interesting and valuable to the trade and manufactures of the district. One other mode of stimulating the progress of education through Institutions should not be omitted. It is that of the prize essay. Most Institutions can point to thoughtful members, who are not much inclined for class work, but are excellent in their way at a discussion or an essay. These are men, generally speaking, whom it is most wise to bring to the surface of their respective societies; and a good prize or two offered annually for the best essays on given topics, would bring out much knowledge of men and manners in those classes of society of which we know in reality very little. For the encouragement of evening schools, both in their establishment and their subsequent efficiency, this Association is excellently adapted, and there is no branch of its operation, so far as it has been worked, that has been attended with better effect, or that promises more fruit in the future, than that one which deals with evening schools. Till within the last few years an evening school was a most rare thing; but now, thanks to the greater liberality of the Privy Council on Education, and to the greater zeal and determination on the part of managers of schools, and more especially on that of the teachers—and, it may be added, thanks to the greater consideration of some large employers of labour—evening schools are now increasing in numbers and improving in character throughout the district. But, even in the best instances, much, very much, yet remains to be done, and the Association, if well supported, can do both good service in showing what it is that is wanted, and in some measure supply the want. One of the best modes of helping the efficiency of school, is to provide for its scholars the advantages of a good system of periodical examination. This is what the Association does, and it is perhaps the way of all others in which it can effect the maximum of good with the minimum of harm. But a good list of prizes is much needed to make the examinations palatable. The work of evening school learning is at the best an irksome work to the scholars. They feel and acknowledge its importance, and will not lightly give up their interest in it; but the flesh is proverbially weak, and working boys, after their day's work is done, want a stimulus to exertion even greater than their love of learning. Prizes, then, are a necessity to the full success of an examination scheme; and the Association may surely hope for that measure of aid that shall render this portion of their programme not only effective, but likewise attractive. Next to the annual examinations, lectures of a thoroughly interesting and instructive kind are, perhaps, the next best way of improving our evening schools and scholars. Illustrations and experiments are peculiarly valuable here. The Scripture, English, or Natural History are all excellent themes for illustration; and there is no portion of the week's work in an evening school more suggestive of good moral lessons than the period of the half-hour's lecture on Monday evenings. But a regular weekly lecture, with suitable pictorial illustrations, is not within the resources of ordinary evening schools. Both the one and the other must be supplied by the Association if supplied at all; and in this way it can render most efficient aid to the thirty or forty evening schools within its boundaries. Another excellent project, lately brought under the notice of the Evening School Board in Union with the Association, is that of organising an Evening Scholars' Annual Exhibition of Work. It is proposed that the productions exhibited should be the work of evening scholars during the preceding year, and that they should be specimens of school-work, such as maps, caligraphy, drawings, &c., or specimens of such industrial work as would be suggested to them in their various occupations, such as examples of carpentering, smiths' work, painting, graining, tool-making, carriage or boat building; or collections of geological and botanical specimens, &c. A scheme for the proper organisation of the above exhibition will shortly be submitted to the Association, and hopes are entertained that it will be received with approbation, and that the Association will be enabled to afford to it a small amount of pecuniary assistance, as the basis of a prize fund. As nothing must be left unattempted that harmonises with the general scheme of making evening schools thoroughly efficient for the great ends of sound education, the Association has, for two years past, organised a meeting of evening scholars for athletic sports. These meetings have been held, by the kind permission of the noble President of the Association, in Hagley-park, and have been, to a certain extent, most satisfactory in their results. To show the popular nature of these sports, at the last meeting, which was held in August, there were upwards of 150 competitors for the few small prizes that were offered, and the day was spent in the most enjoyable and proper manner. Having thus briefly sketched the past, and what may be, as I hope, the future programme of this useful Association, I hope I may be permitted to appeal to the wealthy manufacturers of South Staffordshire for that measure of support to its funds to which its objects entitle it. These objects are no other than those of helping the development and extension of a sound system of national education for working boys, through the means of evening schools. Thousands of these boys have never had the least school-learning whatever; and thousands of others, in their daily toil, are rapidly forgetting what little they have once learned. But already signs of improvement are abroad. Many of the manufacturers of the district are fully alive to the claims of their working boys; and their difficulty, singularly enough, lies not in their own indisposition to help them in their education, but in the indisposition of the boys to receive the boon. Still, things are improving. Several firms of the district have built schools which are second to none for efficiency. One firm, noted for its efforts to diffuse instruction amongst its workpeople, regularly encourages all the boys in its employment to present themselves for an annual examination, thinking, wisely no doubt, that no better stimulus can be afforded to a boy to improve his education than that of a knowledge of his own ignorance. It argues well, again, that the very firms that do most in the way of providing schools for their own workpeople are amongst the most liberal supporters of this Association. The Association, therefore, hopes for the best, and trusts to have more sympathy with it in its future than it has had in its past career."

WEST RIDING EDUCATIONAL BOARD.—On Saturday last,

the 8th Sept., through the kindness of Dr. Heaton, a meeting of ladies resident in the chief towns of the West Riding, interested in the education of girls, was held at his house, Claremont, Leeds, for the purpose of discussing the scheme of the university examinations for girls, with Mr. J. G. Fitch, M.A., Assistant-Commissioner of the Schools Inquiry Commission; Mr. Henry H. Sales. hon. sec. to the West Riding Educational Board; and Miss E. Davies, the authoress of many works on the social and intellectual advancement of women. After luncheon the subject for consideration was introduced by Dr. Heaton, who remarked that, although the meeting was held in his house, neither Mrs. Heaton nor himself should be regarded as the promoters thereof. It was thought that ladies would more readily enter into a discussion in a private room, and he was ever ready to assist any measure of public welfare; hence the issue of the invitations. As regarded the university examination of girls they must all feel that a test of the efficiency of the instruction given in these schools was alike valuable to teachers and parents. On his part, he not only should be willing for his children's knowledge to be tested, but should value any honours they might gain. Mr. Fitch had been good enough to turn aside from his very heavy duties to attend the meeting, and he no doubt would enter very fully into the matter before them. After a lengthened address by Mr. Fitch, an interesting discussion ensued, and the result of the meeting was the formation of a committee of ladies to superintend the Cambridge local examination, to be held in Leeds in December, in connection with the Board.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 663).

GERMAN.

THREE HOURS ALLOWED.

Each candidate is expected to translate one of the passages of Section I., to answer four of the questions of Section II., and to turn into German twelve of the sentences given in Section III. Candidates for a first Class must translate one piece of Section I., answer (*e*), (*f*), and (*g*) of Section II.; render into German 17–20 inclusive, of Section III.; give answers to the questions on the history and literature of Germany, and write out in German the essay.

Section I.

1. Heinrich von Brederode, Herr von Viane und Burggraf von Utrecht, leitete seinen Ursprung von den alten holländischen Grafen ab, welche diese Provinz ehemals als souveräne Fürsten beherrscht hatten. Ein so wichtiger Titel machte ihn einem Volke theuer, unter welchem das Andenken seiner vormaligen Herren noch unvergessen lebte, und um so werther gehalten wurde, je weniger man bei der Veränderung gewonnen zu haben fühlte. Dieser angeerbte Glanz kam dem Eigendünkel eines Mannes zu statten, der den Ruhm seiner Vorfahren stets auf der Zunge trug, und um so lieber unter den verfallenen Trümmern der vorigen Herrlichkeit wandelte, je trostloser der Blick war, den er auf einen jetzigen Zustand warf. Von allen Würden und Bedienungen ausgeschlossen, wozu ihm die hohe Meinung von sich selbst, und der Adel seines Geschlechts einen gegründeten Anspruch zu geben schien (eine Schwadron leichter Reiter war Alles, was man ihm anvertraute), hasste er die Regierung, und erlaubte sich, ihre Massregeln mit verwegenen Schmähungen anzugreifen. Dadurch gewann er sich das Volk. Auch er begünstigte im Stillen das evangelische Bekenntniss.

2. Der König ritt herab vom Stein zu Baden
Gen Rheinfeld, wo die Hofstatt war, zu ziehn,
Mit ihm die Fürsten Hans und Leopold
Und ein Gefolge hochgeborner Herren.
Und, als sie kamen an die Reuss, wo man
Auf einer Fähre sich lässt übersetzen,
Da drängten sich die Mörder in das Schiff,
Dass sie den Kaiser vom Gefolge trennten.
Drauf, als der Fürst durch ein geackert Feld
Hinreitet—eine alte grosse Stadt
Soll drunter liegen aus der Heidenzeit—
Die alte Veste Habsburg im Gesicht,
Wo seines Stammes Hoheit ausgegangen—
Stösst Herzog Hans den Dolch ihm in die Kehle,
Rudolph von Palm durchrennt ihn mit dem Speer,
Und Eschenbach zerspaltet ihm das Haupt,
Dass er heruntersinkt in seinem Blut.
Gemordet von den Seinen auf dem Seinen.

3. Ein edler Mensch zieht edle Menschen an,
Und weiss sie festzuhalten, wie ihr thut.
Um deinen Bruder und um dich verbinden
Gemüther sich, die euer würdig sind,
Und ihr seid eurer grossen Väter werth.
Hier zündete sich froh das schöne Licht
Der Wissenschaft, des freien Denkens an,
Als noch die Barbarei mit schwerer Dämmrung
Die Welt umher verbarg. Mir klang als Kind
Der Name Hercules von Este schon,
Schon Hippolyt von Este voll ins Ohr.
Ferrara ward mit Rom und mit Florenz
Von meinem Vater viel gepriesen! Oft
Hab' ich mich hingesehnt; nun bin ich da.

* * * * * *

Italien nennt keinen grossen Namen,
Den dieses Haus nicht seinen Gast genannt.
Und es ist vortheilhaft den Genius
Bewirthen; giebst du ihm ein Gastgeschenk,
So lässt er dir ein schöneres zurück.
Die Stätte, die ein guter Mensch betrat,
Ist eingeweiht; nach hundert Jahren klingt
Sein Wort und seine That dem Enkel wieder.

5. Heinrich III. ist auch unter den Kaisern zu nennen, welche die eigne Bildung durch Liebe zu den Wissenschaften, durch Gunst gegen ausgezeichnete Männer, und durch Förderung der Bildung im Allgemeinen bewiesen haben. Die Aufforderung des Lebensbeschreibers seines Vaters, Wippo, in einem eigenen an ihn gerichteten lateinischen Gedichte, dass er auch die Kinder der weltlichen Grossen in den Wissenschaften unterrichten lassen möge, hat er durch Sorge für die Schulen eifrig in Erfüllung gebracht. Es blüheten unter ihm vorzüglich die Schulen zu Lüttich, Lobbes, Gemblours, Fulda, Paderborn, St. Gallen, Reichenau u. a. In den beiden zuletztgenannten Schulen bildete sich einer der grössten Gelehrten der damaligen Zeit, Hermann der Contracte, von Jugend auf so gelähmt, dass er nur mit grosser Mühe schreiben konnte, ja so schwer mit der Zunge, dass seine Schüler erst langsam ihn verstehen lernten, und doch so gesucht und geehrt von ihnen, dass sie aus allen Ländern zu ihm strömten.

Section II.—Grammar and Idioms.

(*a*.) Form diminutives of *Garten*, *Knabe*, *Haus*, *Buch*, *Strausz*, *Krug*.

(*b*.) State gender, number, and case of the following substantives:—*des Bösen*, *Ländern*, *der Frauen*, *der Bande*, *Geiste*, *der Mütter*.

(*c*.) Form the comparative and superlative of *gern*, *hart*, *viel*, *grosz*, *nahe*.

(*d*.) Decline in every case, singular and plural, the German of:—New book; this high house; his older table.

(*e*.) When do neuter verbs take *haben* and when *sein* as auxiliary verbs? Illustrate the rule by two examples for each auxiliary.

(*f*.) Conjugate the present and imperfect of *hauen*,

stehlen, werfen, singen, wissen, and add the participle past of each.

(*g*.) Was soll das heiszen?
Was gilt's?
Bekümmern Sie sich um sich.
Er läszt viel drauf gehen.
Er hat alles aufs Spiel gesetzt.
An wem ist nun die Reihe?
Wie ist er denn dahinter gekommen?
Ich kehre mich nicht daran.
Das ist ganz und gar aus der Luft gegriffen.
Es wird auch nicht viel darauf ankommen.
Das wird noch recht übel ablaufen.
Sie stacken alle unter einer Decke.

Section III.

[The writing, either in English or German characters, must be very legible.]

1. I bought three yards and a half of ribbon.
2. Many people have arrived in town.
3. Twelve times twelve are one hundred and forty-four.
4. It is a quarter to nine by my watch.
5. We who came yesterday had the advantage.
6. I have had a pair of boots made.
7. I have not been able to see you.
8. He who talks much does little.
9. With great anxiety they were waiting for him.
10. The table was ten feet long and five feet wide.
11. When you come again to our neighbourhood, you must call in.
12. Do write to us as soon as you can.
13. I would give all the treasures of the world for it.
14. Do you see that black and white horse?
15. Had I your money, I should travel to Italy.
16. Would that I had done everything well!
17. Do you believe him to be honest?
18. They are dear friends of ours.
19. One of my books had fallen under the table.
20. Till Clive appeared in India, his countrymen were despised as mere podlars, while the French were revered as a people formed for victory and command. His courage and capacity dissolved the charm. With the defence of Arcot commences that long series of Oriental triumphs which closes with the fall of Ghizni. Nor must we forget that he was only twenty-five years old when he approved himself ripe for military command. This is a rare if not a singular distinction. It is true that Alexander, Condé, and Charles the Twelfth won great battles at a still earlier age; but those princes were surrounded by veteran generals of distinguished skill. Clive, an inexperienced youth, had yet more experience than any who served under him. He had to form himself, to form his officers, and to form his army. The only man, as far as we recollect, who at an equally early age ever gave equal proof of talents for war, was Napoleon Bonaparte.

Questions on German History and Literature.

(*a*.) Which are the most renowned emperors of the Saxon and Hohenstaufen house?

(*b*.) When and under whom was the first crusade undertaken?

(*c*.) What struggles had Frederic I. to contend with? How, when, and where did he die?

(*d*.) State what you know about Hans Sachs and his works?

(*e*.) Who is the great satirist in the sixteenth century?

(*f*.) Name the principal *Volksbücher*.

Write in German a short essay on "The blessings of peace."

ITALIAN.

THREE HOURS ALLOWED.

Candidates for a first-class certificate must translate the following passage, and answer the grammatical questions based on it:—

1. Quando noi fummo fatti tanto avante,
Ch'al mio maestro piacque di mostrarmi
La creatura, ch'ebbe il bel sembiante,
Dinanzi mi si tolse, e fe restarmi,
Ecco Dite, dicendo, ed ecco il loco,
Ove convien che di fortezza t'armi.
Com' i' divenni allor gelato e fioco,
Nol dimandar, Lettor, ch' i' non lo scrivo,
Però ch' ogni parlar sarebbe poco.
I' non morî, e non rimasi vivo:
Pensa oramai per te, s'hai fior d' ingegno,
Qual'io divenni, d'uno e d' altro privo.
Lo 'mperador del doloroso regno
Da mezzo 'l petto uscía fuor della ghiaccia:
E più con un gigante i' mi convegno,
Che i giganti non fan con le sue braccia:
Vedi oggimai, quant' esser dee quel tutto,
Ch' a così fatta parte si confaccia.
S' ei fu sì bel, com' egli è ora brutto,
E contra 'l suo fattore alzò le ciglia,
Ben dee da lui procedere ogni lutto.
O quanto parvè a me gran meraviglia,
Quando vidi tre facce alla sua testa!
L'una dinanzi, e quella era vermiglia:
L' altre eran due, che s'aggiungéno a questa,
Sovr' esso 'l mezzo di ciascuna spalla,
E si giungéno al luogo della cresta:
E la destra parea tra bianca e gialla;
La sinistra a vedere era tal, quali
Vengon di là, ove 'l Nilo s' avvalla.
Sotto ciascuna uscivan duo grand' ali,
Quanto si conveniva a tant' uccello:
Vele di mar non vid' io mai cotali.
Non avén penne, ma di vipistrello
Era lor modo: e quelle svolazzava,
Sì che tre venti si movén da ello:
Quindi Cocito tutto s' aggelava.

Dante, Canto XXXIV., Inferno.

Tolse: Give the two infinitive moods of this verb.

Fe: How is this word more generally written?

Rimasi: Give the two participles past of this.

Uscía: Write the whole present tense of the indicative.

Dee: What are the other two forms of this person of the verb?

Parve: Give the whole present tense of the indicative.

Aggiungéno: Is this the usual form of this word? How should it be now otherwise written?

2. Translate into Italian:—

The progress of elegant literature and of the fine arts was proportioned to that of the public prosperity. Under the despotic successors of Augustus, all the fields of the intellect had been turned into arid wastes, still marked out by formal boundaries, still retaining the traces of old cultivation, but yielding neither flowers nor fruit. The deluge of barbarism came. It swept away all the landmarks. It obliterated all the signs of former tillage. But it fertilized while it devastated. When it receded the wilderness was as the garden of God, rejoicing on every side, laughing, clapping its hands, pouring forth in spontaneous abundance, everything brilliant, or fragrant, or nourishing. A new language, characterised by simple sweetness and simple energy, had attained perfection. No tongue ever furnished more gorgeous and vivid tints of poetry; nor was it long before a poet appeared who knew how to employ them. Early in the fourteenth century came forth the Divine Comedy, beyond comparison the greatest work of imagination which had appeared since the poems of Homer. The following generation produced, indeed, no second Dante; but it was eminently distinguished by general intellectual activity. The study of the Latin writers had never been wholly neglected in Italy. But Petrarch introduced a more profound, liberal, and elegant scholarship, and communicated to his countrymen that enthusiasm for the literature, the history, and the antiquities of Rome which divided his own heart with a frigid

mistress and a more frigid Muse. Boccaccio turned their attention to the more sublime and graceful models of Greece.—(Macaulay's Essays.)

3. Italian idioms to be translated into their English equivalents:—

Ne corre voce.—Davvero non v'è da ridere—Fatevi forza se volete riuscire.—Ebbe grido di galantuomo.—Me ne duole assai assai.—Non giovano le parole ci voglion fatti.—Egli cammina a stento.—Stento a crederlo.—Lo trassi in disparte.—Non me n'avvidi.—Fatevi in qua.—Questa non è da voi.—Così si tratta co' pari vostri.—Si vuole che sia partito.

Candidates for second or third-class certificates are required (1) to translate into English the following extracts, and (2) to answer the grammatical questions given below.

Federigo Borromeo, nato nel 1564, fu degli uomini rari in qualunque tempo, che abbiano impiegato un ingegno egregio, tutti i mezzi d'una grande opulenza, tutti i vantaggi di una condizione privilegiata, un intento continuo nella ricerca e nell'esercizio del meglio. La sua vita è come un ruscello che spiccato limpido dalla roccia, senza ristagnar nè intorbidirsi mai in un lungo corso per diversi terreni, va limpido a gittarsi nel fiume. Tra gli agi e le pompe, egli badò fin dalla puerizia a quelle parole di abnegazione e di umiltà, a quelle massime intorno alla vanità dei piaceri, all'ingiustizia dell'orgoglio; alla vera dignità e ai veri beni, che, sentite o non sentite nei cuori, vengono trasmesse da una generazione all'altra nel più elementare insegnamento della religione. Badò, dico, a quelle parole, a quelle massime, le pigliò in sul serio, le gustò, le trovò vere: comprese che dunque non potevano essere vere altre parole ed altre massime opposte, che pur si trasmettono d' età in età, colla stessa asseveranza, e talvolta dalle stesse labbra; e propose di prender per norma delle azioni e dei pensieri quelle che erano il vero. Per esse intese che la vita non è già destinata ad essere un peso per molti, e una festa per alcuni; ma per tutti un impiego, del quale ognuno renderà conto: e cominciò fanciullo a pensare come potesse render la sua utile e santa.

"Pur troppo!" disse Federigo, "tale è la misera e terribile nostra condizione. Dobbiamo esigere rigorosamente dagli altri quello che Dio sa se noi saremmo pronti a dare: dobbiamo giudicare, correggere, riprendere; e Dio sa quel che noi faremmo, nel caso stesso, quello che abbiamo fatto in casi somiglianti! Ma guai, s' io avessi da pigliar la mia debolezza per misura del dovere altrui, per norma del mio insegnamento. Pure, è certo che, con le dottrine, io debbo dare altrui l' esempio, non rendermi simile al Fariseo, che impone altrui importabili pesi, i quali egli non vuol pur toccare col dito. Or bene, figliuolo e fratello; poichè gli errori di quei che presiedono sono spesso più noti altrui che non a loro; se voi sapete che io abbia, per pusillanimità, per rispetto qualunque, trascurato qualche mio obbligo, ditemelo francamente, fatemi ravvedere; affinchè, dove ha mancato l' esempio, sovvenga almeno la confessione. Dimostratemi liberamente le mie debolezze; allora le parole acquisteranno più valore nella mia bocca, perchè sentirete più vivamente, che non son mie, che sono di Chi può dare a voi e a me la forza necessaria, per far ciò che prescrivono."—(Manzoni, I Promessi Sposi.)

Grammatical Questions.

1. Give the gender of nouns ending in *a* and in *o*, and the various exceptions to the rule in either termination.

2. Translate the following sentences, illustrative of comparatives and superlatives:—Better late than never. —The happiest of men.—Stronger than the lion.—She is as good as she is fair.—He is more learned than wise.—A very great danger.—We are less fortunate than you (are).—Light as a feather.

3. Explain the distinction of meaning between the demonstrative pronouns *quello* and *colesto*.

4. Write the whole present tense of the indicative of *dire*; the imperfect of *trarre*; the preterite of *sapere*; the future of *volere*; the conditional of *rimanere*; the imperative of *andare*; the present of the subjunctive of *sentire*; the imperfect of *essere*; the participle past of *condurre, prendere, morire, scegliere.*

(To be continued.)

INDIAN MAIL ROUTE.

Brindisi, the ancient Brundusium, was regarded of old by the Romans as the best harbour on the coast of the Adriatic, and was used as such in crossing to Dyrachium, on their way to Greece. In the fifteenth century, however, during one of the endless wars in Italy at that time, a prince of Taranto partly destroyed the port in order to keep his enemies out. Brindisi happens to be the Italian port the nearest to Egypt, to which railway communication has up to this time been extended. There is accordingly every probability that this port will resume its ancient importance, as the stream of the traffic between England and India is now being diverted to pass through Brindisi.

Owing to the completion of the Italian railways it became a question whether advantage might not be taken of them for changing the port of departure of our Indian mails from Marseilles to some Italian port, by means of which the uncertainty ever attending a sea voyage might be greatly diminished. Accordingly Captain Tyler, R.E., who had already reported for the Government upon the summit railway now in course of construction over Mont Cenis, on the central rail system, under the direction of Mr. J. B. Fell, was instructed by the Postmaster-General to examine the railways and ports of Italy with reference to the adoption of a new route for the conveyance of our Indian mails. During the summer Capt. Tyler has made the inspection, and from his report it appears that the present route now employed, measuring 853 miles from London to Marseilles, and 1,460 nautical miles from Marseilles to Alexandria, is, in point of distance, nearly the shortest that can be adopted; but as it is practicable to travel more than twice as fast on land as by sea, besides the lessened risk of delay, as soon as the railway down to the east coast of Italy was opened, it became clear that some port in the south could be advantageously substituted for Marseilles as the point of departure for the sea journey to Egypt. The nearest of these ports is Brindisi, 1,504 English miles from London by the Mont Cenis route, and 822 nautical miles from Alexandria. There would thus be a saving of 734 miles in the sea passage, and an increase of 651 miles in the land passage. There are two other ports, Otranto and Gallipoli, which are each 37 nautical miles nearer Alexandria than Brindisi; but the first has no protection for bad weather from a north-easterly direction, and no existing accommodation for a mail-packet station; and Gallipoli is subject to similar objections. Nor could Taranto well be selected for a mail station, as the Italian Government have determined to make it their principal military southern port; the weather, too, is frequently bad and the sea rough at its entrance, and Brindisi appears generally a much easier port to make. Another place on the Italian coast inspected by Captain Tyler is Reggio, which, though it has the advantage of being on the straight course of a steamer passing by the Straits of Bonifacio and the Straits of Messina, from Marseilles to Alexandria, is merely an open roadstead without protection, especially from southerly gales. Naples would seem to be a more desirable place, but for a steamer to call there, on its way between Marseilles and Alexandria, would increase its journey by 180 nautical miles as compared with the sea passage *viâ* Brindisi. The railway communication between Naples and the north of Italy is not yet completed. There is also no landing stage or pier at the Porto Grande, the commercial port of Naples. When railway communication is completed to Naples

viâ Foggia, or, still more, when it is complete *viâ* Genoa and Rome, Naples may become an important place of call for the steamers, but it can never compete with the Brindisi route, from the extra length of the passage.

The harbour of Brindisi consists of an outer port, 2,000 metres long by 1,000 metres wide, connected by a channel 260 metres long and 60 metres wide, with two inner arms, on the west coast of the Adriatic. The late operations seem to have been the first which have been tried since the injury caused to the port by the Prince of Taranto, with the view of clearing the channel of the consequent accumulations of sand. As showing the success of the late works, Captain Tyler himself observed some contract steamers of the Italian Government in this harbour which were then drawing from 13ft. 6in. to 14ft. of water. Other different works are being carried out, amongst which is a hauling slip for vessels up to 2,000 tons burthen, a quay 500 metres long, a breakwater 380 metres long, besides other harbour works, among which are 260 metres of quays, destined for the goods station of the railway. The most important of all for the purpose in hand are the excavations by dredging and the erection of a convenient landing stage. The Italian Government are ready to provide this accommodation by the spring of next year, should the British Government determine to forward the Indian mails by Brindisi: and thus, after a full consideration, Captain Tyler concludes that Brindisi is the best harbour on the south of Italy for a mail port.

The port would be approached by the mails running on the same lines as at present from Paris as far as Macon. The train would there diverge to take the line to Amberien, Culoz, Chambery, and St. Michel. Between the first two places especially the gradients are steep and the curves sharp; the permanent way is of the ordinary kind, but the joints have not yet been fished between Macon and Culoz. It now takes six hours and five minutes to travel on the line from Macon to St. Michel. The passage from St. Michel over the Mont Cenis, now performed by horses and mules, is regular enough in summer, but it is necessarily subject to serious interruptions in winter.

The summit railway over Mont Cenis, from St. Michel to Susa, is now being rapidly proceeded with. Messrs. Brogden and Co. are to deliver the 3,000 tons of permanent way for the Italian side before the last of September; and on the French side of the mountain the three bridges near St. Michel were far advanced, and are probably now finished. It was objected to Mr. Fell's line that it would be liable to suffer from snowdrifts and avalanches. At the most dangerous places masonry covered ways will be constructed, and timber covered ways for the lighter drifts or falling snow. The contract for the materials of the permanent way on the French side has been undertaken by the "Terre Noire" Company. Captain Tyler made some further experiments with one of the engines, and he sees "no reason to alter the favourable opinion he has already expressed on the principle."

He also inspected the works of the Mont Cenis tunnel. The great question as to when it will be completed depends on the thickness of the quartz, the quality of the strata at the other parts of the excavation, and the supply of money and labour. About 400 men, including some of the best workmen, were leaving for the Italian army at the very time Captain Tyler was there. It is, nevertheless, possible that the tunnel may be completed by May, 1871; but then approaches on each side have to be constructed, so that "the shortest time, looking at the matter itself in an engineering point of view," will be at the earliest towards the end of 1871; "and it is impossible to calculate at present upon the future financial condition of Italy, and the effect it may have upon the works." On its completion, however, mail trains will be able to run from Calais to Brindisi for 1,390 miles, without break of guage, in about fifty-four hours. Captain Tyler calculates that the eastern mails could be taken from Macon to Alexandria, over the Brindisi route, by the summit railway with Mr. Fell's engines, in 123 hours 8 minutes; and that the whole could be brought into operation by the 1st of June next year. The mails could thus be punctually conveyed between London and Alexandria within 150½ hours; and when the tunnel and permanent line between St. Michel and Susa are at work, in 147½ hours. Then would come the necessity for sleeping carriages during the fifty-four hours without stoppage, from Calais to Brindisi. And in answer to an inquiry of our Board of Trade inspector, the Italian Government have offered to convey the passengers in carriages of the kind at the low rate of fifteen centimes per kilometre. As, until the completion of the main line, the mails will have to be transferred at St. Michel and Susa, from the 4ft. 8½in. to the 3ft. 7½in. guage, and *vice versa*, Captain Tyler proposes that the mail bags be enclosed in large water-tight chests, to be shifted by cranes at the different places of transfer. It was attempted to use bags instead of smaller boxes shifted by hand labour; but last year, when the cholera was raging in Egypt, these sacks were thought to carry the infection more readily than boxes. Some 325 boxes of wood or iron have now to pass monthly through France to the East, and they are necessarily often thrown about with great violence. The use of cranes and larger packages seems a very practical proposal.

In concluding his report, Captain Tyler points to the yet greater saving of time and distance that will be obtained when a railway shall be constructed along the Euphrates Valley to the Persian Gulf. Several hundred miles and entire days would be saved in the passage from London to Bombay. Then the navigation of the Persian Gulf to Bombay—easier by far than that *viâ* Suez and the Red Sea—would be obviated by the connecting together of Bagdad to Bombay by rail. On account of the insufficiency of the guarantee of the Turkish Government, from the weak financial state of the empire, the Euphrates Valley Railway scheme has been in abeyance for some years.

SPECIAL EDUCATION IN FRANCE.

Architecture.—The educational session has just closed and the annual prizes distributed, under the presidency of the authorities belonging to the departments of the Beaux Arts and education. A sad bereavement, the second within a very short period, has robbed those interesting meetings of the simple but fervent addresses of the indefatigable Minister of Public Instruction, M. Duruy, but his spirit has not been absent. In all quarters there is evidence of a watchful determination to render education of all kinds as sound and effective as possible; the moment any deficiency is discovered in the system means are taken to supply it, no preconceived idea, no prescribed form, no hesitation is permitted to stem the course of reform in these important matters.

The new central school of architecture, the establishment and progress of which have been duly recorded in the *Journal*, is doing good work in rendering the training of youths intended for architects more systematic and complete; but the very completeness of the plan creates difficulties in carrying it out, and the observation of these difficulties offers valuable hints for all the world. It has been found, on examination of candidates for admission, that many youths of good abilities have failed to satisfy the requirements of the school, not for want of ability, but because they have not sufficiently appreciated the importance of the preliminary knowledge required of them, or, in other words, for want of sufficient general instruction to enable them, according to the opinion of the examiners, to enter upon the special portion of their education with advantage. In order to prevent such failure in future, the council of the school has just issued a note on the method employed at these preliminary examinations. The candidates are submitted to three

examinations:—1. Proficiency in drawing from copies and in architectural drawing entitles the candidate to a certain mark in each case, and the average of the two marks, which are represented by numbers indicative of the amount of that proficiency, gives the value of general proficiency in drawing. 2. The mathematical examination is divided into seven questions, each of which gives a mark, and the average of these marks, as in the former case, indicates the position of the candidate in mathematics. 3. The written literary examination and the oral examination in geography and ethnography give two marks, and the average of the two indicates the candidate's acquirements in literature. The average of the three marks thus obtained gives, of course, the candidate's general proficiency, and it moreover determines his classification on entering the school. The direction of the school has evidently no idea of lowering its standard of admission, and of thus allowing its special object to be thwarted by the general incompetence of any youths admitted within its walls. The importance of thus insisting on the necessary amount of previous training cannot be too generally enforced; its neglect has too often proved a fertile source of mediocrity.

FINE ART AS APPLIED TO INDUSTRY.—The same spirit of reform that is exhibited by the Council of the new school of architecture appears in connection with the old school of drawing, mathematics, architecture, sculpture, ornamentation, and wood engraving, as applied to industry.

Important alterations are announced in the address of the Count de Nieuwerkerke, who lays special stress on the necessity of general cultivation previous to special training. In fact, according to the statement of the Count himself, who was formerly a pupil in the school and afterwards professor there for twenty-five years, the whole course of its studies is to be gradually reorganised under his direction. The teaching of drawing is to be dealt with immediately; drawing from memory, which has hitherto been only practised experimentally and very partially, is to be made a regular part of the course of instruction, as peculiarly adapted for the development of the faculties of attention and observation. The success which has attended this method in the case of a small class of pupils is declared to have been remarkable. For some time an *atelier* has been attached to the school for testing a method which originated with Count Nieuwerkerke himself; this *atelier* will in future become an integral portion of the school; it will form a kind of senior class or upper school in which all the studies of the regular course will be, as it were, combined and epitomised, and it will be equally applicable to those pupils who are intended for artists, artizans or teachers. The latter will form a special class, and will be instructed in the methods of conveying information, which they will have the opportunity of putting into practice in the classes of the school itself. The *atelier*, as it is called, will, in their case, become a normal school, and its pupils will eventually receive a professional diploma. Means are also being taken, to quote the Count's words, "to open more and more the road to the artistic industries, in developing the study of decorative figures, flowers, plants, ornaments, carving and engraving, and to prepare young men for the various trades and professions which are connected with architecture, masonry, and carpentry, or which require the application of mathematics." Each of these studies will be encouraged by various prizes.

These are not solitary or accidental cases, but instances of the attention which is now being given to the improvement of all branches of education, general and special, in France.

Manufactures.

INTERNATIONAL EXHIBITION OF HOPS AND BEER.—An exhibition of hops, of beer, and of everything relating to the cultivation of hops and the manufacture of beer, will be held at Dijon, at the Hôtel de Ville, from the 10th to 15th October, 1866. The producers, brewers, and manufacturers of brewing utensils of all countries are invited to take part. The demands for admission are to be sent in, before 15th September, to M. Ladrey, Secretary to the Central Committee of Agriculture of the Côte d'Or, at Dijon. The articles for exhibition will not be received later than the 8th October. The duties of the jury will commence on the 11th October, and continue for the following days. The distribution of prizes will take place on the 14th, and the exhibition will be closed on the following day at 4 p.m.

CONFERENCES AT THE IMPERIAL ASYLUM OF VINCENNES.—The asylum for convalescent workmen at Vincennes, established under the patronage of the Empress, is one of the most interesting, benevolent, and useful institutions which have been inaugurated under the present reign in France. The situation of working men, between the time of rising from a bed of sickness and that of complete restoration of health, is one of no ordinary difficulty and danger. Enforced idleness is always surrounded by temptations, and, in the case of the less cultivated classes, want of means adds an additional cause of evil. In the asylum alluded to convalescent workmen enjoy proper and regular meals, pure air, and means of instruction and recreation. In April last it was determined that lectures, or conferences, on subjects specially interesting to the class to which they were addressed, should be delivered three times a week in the asylum, and the course was opened by the Archbishop of Paris; the other gentlemen who have lent their aid to the good work are mostly all known to the scientific world, and include MM. Baudrillart, Daubrée, Delaunay, Joseph Garnier, Janet, Morin, Payen, Perdonnet, de Quatrefages, Simonin, Waddington, and Wolowski. The conferences are under the direction of a commission, appointed by the Minister of the Interior. A discourse, delivered by M. Baudrillart, on the life of Jacquard, the famous weaver of Lyons, has attracted great attention; the reputation of the professor, and the peculiar fitness of the subject to the circumstances under which it was delivered, render this in no way surprising. The lecturer dwelt especially on the difficulties which surround humble inventors, or rather inventors in humble stations in life, and on the effects of the introduction of mechanical contrivances into manufactures. "Whence came," asked M. Baudrillart, "before 1789, the persecution against inventors, machines, new processes, and their authors? From the regime of monopoly in industry, from privilege. The system of corporations in arts and manufactures which reigned everywhere, in all professions and callings, under all kinds of forms, was incompatible with the spirit of invention. Invention was an act of sedition on the part of the human mind, a revolt against the wisdom of our ancestors, who believed they had provided for all emergencies by regulating everything. To each corporation belonged the exclusive right in this or that manufacture, sale, process, or instrument, secured by penalties of the severest kind. Woe to the daring innovator who should attempt to interfere with this order of things. If anything should cause surprise with such a system, it is that there should have been any invention at all. It was by special favour or by tolerance that invention slipped in from time to time under the protection of royalty, which thus conferred that very form of privilege which was so fatal to itself." Then, turning towards another phase of the subject, he added:—"When Jacquard invented his famous loom a change had come over everything. The National Assembly had enfranchised labour, and given full liberty to industry and to inventors. Opposition could not then arise from privilege, which had been disarmed and destroyed. Whence came it, then? Here we have to look to a painful spectacle. Invention only asked for liberty; it was liberty that persecuted it. This, happily, did not always

happen. Generally free labour gave the inventor a good reception, but not always. Liberty has its ignorances and its persecutions. It is of these that she must cure herself, if she would be safe and fruitful. People overlook the fact that liberty of labour has its risks. Its benefits are eagerly sought without reflecting upon the difficulties which may have to be encountered. Thus we find leagues formed, not only of masters and inventors against other masters and inventors, but of workman against a workman—their brother in toil and poverty. Sad spectacle! The people, turning as it were against itself, at the moment when the *aureola* of invention begins to shine around the head of one of their own class, find nothing but threats of death to offer him." Jacquard lived to the age of eighty-two years; he was born at Lyons, in 1752, was in full manhood in the time of Louis the Sixteenth, and died in 1834, in the reign of Louis Philippe. His first recorded invention was that of a machine which produced, in a few minutes, a knife which took four men a whole day to produce. This machine was destroyed by the cutlers, who looked upon it as the destruction of their business. The father of Jacquard was a weaver of embroidered fabrics, and his mother a pattern reader, and the mind of the young inventor was early at work to simplify these operations. But the silk manufacture fell into a miserable condition, and young Jacquard, now a married man, was reduced to stoke the fires of a lime-burner for his bread. During the revolution and the convention he was a soldier, and his only son fell mortally wounded by his side at Haguenau. When peace was restored in France, and the silk-trade was resuscitated, Jacquard was fifty years of age; he set to work ardently to carry out his idea, and substitute for the drawboy the beautiful system of automatic pattern cards, which bear his name. At an industrial exhibition, held in 1801, and at which the celebrated statesman, Charles James Fox, was present, the Jacquard loom won for its inventor a bronze medal and a patent of ten years' duration. About the same time he invented a machine for making fishing-nets, which earned him a large gold medal, and his native town paid him distinguished honour. Soon after this he was sent to Paris by the Prefect of the Rhone, and was employed for two years in repairing and arranging the machines and models in that establishment. Here he invented a loom for weaving velvet ribbon with a double face, and a system of weaving cotton with two and three shuttles. Amonst other things he repaired the automatic loom of the famous Vaucanson, which performed the same work as the Jacquard, but less expeditiously and at greater cost. (The two machines may now be seen together in one case in the Conservatoire des Arts et Metiers.) In 1804 his machine was adopted by a manufacturer of Lyons, and in 1806 an imperial decree authorised the municipal authorities of Lyons to purchase the invention for the public, and to give Jacquard an annuity of £120, with a reversion of half the amount to his widow. It was not long, however, before popular clamour rose up against him, which frequently placed even his life in jeopardy. His latter days were spent in tranquillity; he retired to a modest cottage at Oullins, near Lyons, where he occupied himself principally with his garden, wearing, with legitimate pride, the Cross of the Legion of Honour on his breast, and his medals suspended as trophies against the wall of his little room. The story of Jacquard is at once painful and pleasing, and was eminently calculated for relation by a savant and an economist to an audience of working men, reduced for a time to inactivity by accident or ill-health.

Colonies.

Sheep Disease in New South Wales.—The scab, which, at different times, has caused much havoc among the flocks in the interior, has now fortunately almost disappeared from the colony. The only sheep now under license—a small flock of 1,300, on the Bojan—have been under the inspection of one of the scab inspectors for one month past, and his report to declare them clean is daily expected. The last lot of sheep destroyed were those burnt on one of the islands down the harbour early in the present year, since which time the disease has not appeared, except on two pet sheep in one of the northern districts, and these were immediately destroyed. This happy consummation has been the result of active exertions of the scab inspectors of the different districts of the interior. By the careful watch they keep over travelling sheep they have prevented the disease from being disseminated, as it is a well-known fact that a whole line of country has in former times been infected, and the flocks decimated by one single flock of unclean sheep having passed through it. These inspectors have to be constantly on the alert, as the number of sheep travelling about the country in search of grass or water is without parallel in the pastoral history of the colony. The runs are now all so heavily stocked that they will not bear in a bad season the amount of stock placed upon them. The consequence is that the feed and the water runs short, and the animals are on the point of starvation; to save them the lessee of the run travels them, takes them to some place two or three hundred miles away, and back again, supporting them on the grass another squatter pays for. By the Impounding Act sheep are allowed to feed upon the grass for half a mile on either side of the road, and this limitation, with the necessity of travelling six miles a day, is considered better than leaving the flocks to starve upon their own bare and overstocked runs. It was estimated about the middle of May that something like 150,000 sheep were travelling round and about the New England district alone, the plains of the lower country to the westward being absolutely bare. Two years ago there were 300,000 scabby sheep in New South Wales. In Victoria the same disease has been in existence for the last fifteen years, after the peculiar manner in vogue amongst her neighbours, and there are now almost millions of scabby sheep within her borders.

Railways in Melbourne.—An annual report has been issued by Government on the railways, which is in all respects satisfactory. The railways are now paying a net dividend of 4¾ per cent. The Government lines have, in the aggregate, cost nearly nine millions sterling, and they could now be constructed for six millions. The gross increase of receipt during 1865 on all the lines was £69,939, and the increased cost of working, £13,000. At all the stations excepting Sandhurst the traffic has increased, more particularly at the wayside stations, thus showing the growth of an intermediate traffic, which will beneficially influence the future revenue. The goods traffic has also increased. In 1861 it was 43 per cent. of the whole, now it is 56¼ per cent. The Murray line showed an increase during 1865 of £50,000, which was mainly owing to the Echnea extension. The Williamstown branch showed an increase of £284,000, and the Ballarat of £20,000.

Land in Victoria.—Up to the 31st Dec., 1865, 5,[illegible] persons had availed themselves of the lending clause of the Land Act, and had taken up under it 1,546,2[illegible] acres, or an average of 290 acres each. 1,573 certificate holders had selected an average of 179 acres each. Since the Act was brought into operation 2[illegible] agricultural areas have been proclaimed, containing 3,847,303 acres, of which 1,827,235 acres have been selected; 177,245 acres have, for various reasons, been withdrawn, and 1,342,823 acres remained open for selection on Jan. 1, 1866. The minimum price which Government will receive for land alienated under this Act is £1 4s. 6d. per acre. As showing the vigilance exercised by Government officers to prevent evasions of the Act, it may be noticed that 414 applications for leases were disallowed on the ground that the applicants were either

agents for others, or had agreed to sell their interest in the land, but eight of these refusals were afterwards revoked, upon satisfactory evidence being produced. The twenty acre clause, which has been brought into operation in the neighbourhood of the gold fields, appears to have been very successful. The applications for licenses under it were 2,810, of which 1,698 were granted, after being investigated by the Commissioners appointed to inquire into them. The whole appearance of some of the gold fields is being altered by the industry of these small settlers, and the best results may be expected to follow the persevering habits which must be induced by the possession of a home. The annual revenue derivable by the State from licenses of this description granted prior to 31st Dec. last was £5,094.

THE TEA PLANT IN AUSTRALIA.—"The important experiment of testing the climate and soil of South Australia, as regards their suitability for the China tea plant," says the *Register* of the 18th June, "is about to be made on a somewhat extensive scale. The government have agreed to pay Mr. Sterndale, who recently brought a quantity of tea seed to the colony, the sum of £50 for one hundred weight of the seed, and they have instructed Dr. Schomburg, superintendent of the Botanic Garden, to sow and distribute it, with the view of fairly testing its adaptability to this country. Accordingly, it has been determined by the governors of the Botanic Garden that one-half of the quantity shall be sown in the grounds of that establishment, and that the other half should be distributed in various parts of the colony."

Notes.

ROYAL CORNWALL POLYTECHNIC SOCIETY, FALMOUTH. —The thirty-fourth annual exhibition of this Society opens on Friday, the 14th inst. (this day), and continues open about a week. Medals, and prizes in money, will be awarded to the following objects:—Machinery and models, mechanical and other scientific inventions and improvements, specimens of naval architecture, natural history, scientific papers, specimens of ornamental art, and to all objects of interest connected with mechanics, science, and the fine and industrial arts, which are considered deserving by the judges of the various departments. It bids fair to exceed in interest and attractiveness any of its predecessors, which—when we consider the comparative remoteness of the locality, and the fact that the exhibitions have been held annually for thirty-four years—says much for the continued zeal and ability of the officers and promoters of the society. The show of models in the mechanical department will be unusually extensive and interesting, prominent among which will be elaborate models by Mr. E. T. Vyvyan, showing the complete system of gold dressing in Australia and California, together with models of the diggers, tents, &c., the whole occupying a space of fifty feet in length; a very magnificent set of models of the mine machinery of Devon Consols has also been forwarded by Mr. Thomas Morris, the managing director, and will be shown in operation. The Art Collection will also be very attractive, comprising works by Egg, R.A., Collins, R.A., Haynes, Williams, Montague, Smallfield, Hart, R.A., Mitchell, Tidey, and others; and two magnificent works, "Eurydice," and the "Fate of Icarus," by Thompson, R.A. Mr. Sidney Hodges's presentation portraits of the Mayor of Penryn and of Captain John Richards will also be exhibited, together with the portrait of the Venerable Bishop of the Diocese, which was painted for Miss Burdett Coutts, and attracted so much notice in the recent exhibition of the Royal Academy. An attractive programme of lectures has also been prepared. Altogether there is every prospect of a most interesting exhibition.

AWARD OF ROYAL EXHIBITIONS.—The Royal Exhibitions to the Royal School of Mines, Jermyn-street, and the Government School of Science, Dublin, consisting of £50 a-year for three years, and free admission to the respective schools, which are awarded by the Science and Art Department after the May science examinations, have this year been awarded as follows. Those to the Royal School of Mines, to German Green, aged 14, monitor at the Lower Islington Public School, and Frederick J. M. Page, aged 17, son of a carriage builder, London. Those to the Government School of Science have been gained by Charles G. Stewart, aged 16, chemist, Camden-town, London; John McAllan, aged 22, chemist's assistant, Dublin; and Stewart Williamson, jun., student of the Royal College of Chemistry, London.

ADULT EDUCATION IN FRANCE.—At the recent distribution of prizes to the pupils and students of the communal schools of the eleventh arrondissement of Paris, M. Charles Robert, Secretary-General of the Ministry of Public Instruction, dwelt with natural pride on what has been done during the past twelve months in that country for the instruction of adults. It was difficult, he said, to imagine the trouble and sacrifices which had been required to establish 25,000 adult classes in the communal schools of France. The results were given by M. Robert as follows:—"From November, 1865, to March, 1866, 30,000 teachers, male and female, taught 25,000 classes of adults, containing a total of 600,000 students; 250,000 illiterate persons were taught to read, write, or cypher. Of the whole number of students 117,000 paid in all a sum of 415,000 francs for their instruction; 15,000 teachers gave their services gratuitously; and 4,000 others subscribed 91,000 francs towards the expenses. The Communes of France gave 650,000 francs towards the work; the departments, 72,000 francs; and the friends of instruction, 125,000 francs." In all £37,520 expended by others, and £16,600 by the illiterate themselves, for the education of adults in five months. Well might M. Robert say:—"The year 1866 is that in which the grand corner stone was laid, and if I had to write an inscription for the plate which it is the custom to fix in a foundation stone, I would simply inscribe the figures just given."

TRACTION ENGINES.—A train drawn by a locomotive on the common roads has recently arrived at Paris. The following details will be read with interest:—The locomotive has a tubular boiler, carries a tender, a water-tank, and foot-plate in front of the engine. The engine is on the top of the boiler; it has two cylinders, with reversing gear. It is worked from the front, by means of a guide-wheel, which is moved by one man; it works with ease and perfect regularity; it can turn in curves of a very small radius, and can follow all the windings of the road. This engine, travelling on a level road, or on one that presents no gradients of more than three per cent., draws an actual load, after deducting the weight of the waggons, of 12,000 to 15,000 kilos., or from twelve to fifteen tons, at a speed of four to six kilometres, or from $2\frac{1}{2}$ miles to $3\frac{3}{4}$ miles per hour. It draws at high speed, that is to say, 14 to 16 kilometres per hour, or nine to ten miles, a clear weight of 1,000 to 4,500 kilograms, or from one to four tons and a half. The waggons are coupled one to another as well as to the locomotive, and by a mode of coupling which allows them to follow all the movements of the engine however much it may deviate from the straight line. The engine stopped at a great number of places on its journey from Nantes to Paris, in order to satisfy the public curiosity.

DISTRIBUTION OF PRIZES TO THE RURAL ELEMENTARY TEACHERS AT TURIN.—The sixth distribution of prizes to the rural teachers by the praiseworthy Società degli Insegnanti took place in the large hall of the gymnasium of Saint Francesco, in the Via d'Angennes, at Turin, on 29th August, under the presidency of Professor Bianchi. These prizes were for both male and female teachers

who had shown themselves deserving of them by good conduct and zeal in their duties.

PARIS EXHIBITION, 1867.—The Imperial Commission having learned that a certain number of plans, more or less exact, of the palace and park of the Universal Exhibition of 1867, are being sold, give notice that the plans of the Exhibition are, up to the present time, the exclusive property of the Imperial Commission. The Imperial Commission, therefore, puts the public on its guard against numerous errors in these published plans. It will be forced to prosecute, or allow to be prosecuted by interested persons, any one who, without an express authorisation, thus makes use of any plan or drawing of the Exhibition.

MACHINE FOR SHELLING PEAS AND BEANS.—Mr. Price, an American engineer, has just invented a very simple machine for shelling peas and beans. It consists principally of a rolling mill; the rollers are covered with india-rubber, fixed on a wooden support, and driven by a crank. At the bottom of the compartment where the rollers work there are holes which let the peas drop into a drawer situated underneath the machine. In working this mill the husks or shells are drawn in and compressed. This compression bursts them, and forces the grain to fall on one side of the machine, whilst the shells pass across it and fall on the other side. It would seem that this machine might find a use, not only in the kitchen, but in chemists' and druggists' shops.

FEMALE DOCTORS.—Last year, after honourably passing two examinations for the Baccalaurèats ès Lettres and ès Sciences, at Montpellier and at Algiers, a young lady was authorised by the Minister of Public Instruction in Paris to go through a preparatory course of medicine in Algiers, as her medical attendance might be of great relief to the Arab population, and through her the boon of medical science might penetrate the tent and harem of the Arab, where no male doctor would ever be admitted. In addition lately another lady has passed her examination as midwife, and has obtained permission to offer herself as candidate for examination at Paris for the degree of doctor of medicine.

COLLECTION OF CARRIAGES IN THE MUSEUM OF CLUNY.—An annex has been built in the garden adjoining the Rue des Mathurins St. Jacques for the reception of the collection of carriages in the Cluny Museum. This building communicates with the gallery of tapestry by means of a corridor of the ancient Palais des Thermes. Commencing at the extreme right, the first object that strikes the eye is a sedan chair, the panels of which are ornamented with garlands of flowers and landscapes painted on a ground of gold. Immediately after is exhibited a sleigh, in red Utrecht velvet. In front of this vehicle there is a winged genius; the outside corners are embellished with caryatides, and the dolphins carved at the end would make it appear to have once belonged to some heir to the crown. On the front of the equipage are exhibited the boots of the postilion, immense strong leather leggings. The harness, which is hung on the wall, is not the least curious; it is made of thongs of leather forming a large net-work, that covers the horses from the breast to the tail. Each crossing is furnished with flowers in gilt copper, and the collars, in the same metal, are open worked. Near it is a saddle, in white leather, quilted with the greatest care, the stirrups of which are padded with the same kind of leather. Farther on may be seen another sedan chair, the panels of which, covered with a light green glazing, are ornamented with baskets of flowers, with escutcheons, and an M formed of garlands hung from the beak of a dove. Next is a sort of Tilbury, not hung, but fixed on an under-frame, with straight shafts; the wheels are placed behind the body. This attempt at modern carriage building is richly decorated, painted red, and ornamented with gilding. It certainly once belonged to some great personage, in spite of its want of comfort; but it must be remembered that it was not until the reign of Louis XIII. that carriages hung from supports were begun to be built in France. Germany was much more advanced in this matter than France, for in 1457 the ambassadors of Ladislaus V., king of Hungary, offered to Queen Mary, wife of Charles VII, a *chariot branlant*, or swinging, and very rich, in which we may recognise a hung carriage. A little more than a century later (1562) the Marshal de Vieilleville, being sent as ambassador by King Charles IX. to the Court of Vienna, the Emperor made him a present of a coach, which was considered in France as a wonder. It was a carriage lined with velvet, and drawn by four Turkish horses, white as snow, and having their tails and manes dyed red. This equipage was driven by a Hungarian coachman, who, as well as the footman, was dressed in the costume of their country, but in the colours of the marshal, which were black and yellow, the dress of the coachman was velvet, while that of the footman was less rich. We next come to a large gala carriage, on four wheels, ornamented with paintings, with gildings, and with designs carved in high relief. The interior is lined with figured silk, and in front of the coach box a panel decorated with a golden crescent, surmounted by an eagle, holding a laurel branch in his claws. The harness of this equipage is for six horses, in white leather, worked with silk. Another four-wheeled carriage is exhibited close by. This one shows by the style the make of carriages under Louis XIV. Carving and gilding are in great profusion; the spokes of the wheels are shaped as balustrades, and the panels are ornamented with subjects by some skilful hand, but they have been awkwardly cut in inlaying with copper. After this cumbersome machine we come to a light sleigh, where elegance and comfort are combined. The vehicle represents a golden dragon, from one end to the other, on runners. The body of this dragon, hollowed out and lined with blue silk, forms a coquettish seat, and the doors are the wings of the animal. On its tail, which "twists in tortuous coils," is placed the seat of the driver, and his feet find a place in silk slippers fastened to the front. There is also to be seen a carriage of the eighteenth century, much less gilded than the preceding one, but also in better taste, although the under framing is too heavy. The panels are decorated with fantastic landscapes, cupids, dolphins, tritons, and mermaids sporting on an ocean that foams under an aventurine atmosphere. Another carriage, of about the same period, has its panels decorated with mythological subjects—Daphne changed into a laurel, Diana and Endymion, Minerva and Neptune disputing the patronage of Athens, the struggle of Apollo with the Satyr Marsyas, and finally the Judgment of Paris, being the principal subjects of this decoration. A very curious vehicle, as regards shape and historical relation, is wanting to this collection—it is that in which Louis XIV. fled from Paris on the 21st June, 1791. The enormous Berline had a salon, a bedroom, a wardrobe, a dining-room, and kitchen. "It wanted nothing," says Mercier, from whom these details are taken, "but a chapel and orchestra of musicians." This carriage is preserved in Sweden by the descendants of M. A. Fersen. The exhibition of carriages does not offer much of interest to archæology, because there the equipages are comparatively modern, but the saddler, coach builder, the ornamentist, &c., may find it a subject worthy of serious study.

TELEGRAPH IN SOUTH AMERICA.—A Commission has been sent to Europe from Peru by the last mail charged with making arrangements for establishing a telegraphic line across Ecuador, Peru, Bolivia, and Chili.

Correspondence.

SNAKE BITES.

The following letter has been addressed to the Secretary of the Society of Arts; the bottle referred to has

een received, and may be seen at the Society's ouse:—

SIR,—Allow me to write to you concerning a bottle a remedy for snake bites, which Mr. Russell, our uditor-General, who leaves Trinidad to-morrow for ngland, has kindly promised to hand to you on his rriving in London. So many such remedies have been roposed, and tried with more or less success, that I feel little hesitation in contributing, in my turn, to the ready very large stock on hand. In my constant mbles through our virgin forests, and in my surveys many of our swamps and rivers, either as director of rests or inspector of roads, I have always felt a lively terest in the study of venomous snakes, and have en-eavoured to gather all the information possible concern-g their habits, and the antidotes used here, more par-cularly by the native Indio-Spaniards, and by the nmigrants from the neighbouring coast of Venezuela, well as by the imported Africans.

In 1846, after a severe attack of swamp fever, caught the survey for a proposed railway through one of ur most unhealthy marshes, I was sent to Martinique r change of air, and lost no time in getting introduced ere to the late Mr. Barillet, the then Director of the otanic Gardens. He was a great collector of serpents, nd was said to possess a specific remedy, which defied e deadly bite of the *Trigonocephalus lanceolatus*, so ommon and dreaded in that colony. When I called on im, in the forenoon, Mr. Barillet was absent in search f some of those snakes, but he soon returned with three plendid live ones. In the course of conversation, and fter he had told me that he always went alone "*à la asse aux serpents*," I asked him whether he really had me infallible remedy, as was reported. He smiled ather complacently, and showing me on his right thumb everal unequivocal marks of "fangs," answered me that is recipe was as simple as it was certain; that it was erely to suck the wound and afterwards apply to it a ttle ammonia; and that, in fact, to prove its effi-iency, he had one day, in presence of many persons, urposely got his thumb bitten by a Trigonocephalus, ithout any accident resulting from the wound, after it ad been well sucked. On my asking him, however, ow, when alone in the woods, and far from any settle-ent, he could use his recipe so easily if he were bitten the back; he suddenly grew pale, and, with a some-hat faltering voice, confessed that the thought had ever struck him before.

Shortly after my return to Trinidad, I tried the suction the case of a young woman who had been stung high the thigh by a large black scorpion, and who was in reat pain, with cramps, and vomiting severely. On er daughter applying her lips to the wound, and suck-g it in right earnest, the patient almost immediately ased vomiting, the pain and cramps disappeared, and e soon fell quietly asleep.

I had no opportunity of myself trying this experi-ent with snake bites, but it was tried last week, near ir Pitch Lake, with complete success by my son, upon e of his men, who was bitten about noon, on the left m, by a "mapipire" (*Crotalus mutus*), one of our most adly snakes. About ten minutes after the wound had en inflicted, the labourer (a black man) was in great ony, and was seized with cramps and vomiting. My n at once made, with a lancet, a small incision in the ound, and had the part sucked, while half a tumbler ll of an infusion, in rum, of Guaco (the *Micania G.*, not e *Aristolochia*), was at the same time administered in-rnally. The pain, cramps, and vomiting gradually bsided; a little ammonia was then applied to the ound, and within half-an-hour the man fell fast asleep, d on his awaking some four or five hours afterwards was weak, but felt no other effect but a sort of general mbness, which disappeared completely the next day. n the second day after the accident he was able to re-me his work.

In the number for the 19th December, 1856, of the *Journal of the Society of Arts*, there is a very interesting communication from Mr. Squier, on the "Remedies for the bites of snakes," followed by a no less interesting extract from Dr. Woodhouse's account of his own case when bitten by a rattlesnake. Being myself very fond of collecting snakes, which I often catch alive, I carefully read those articles, and am glad to say that I fully agree with Mr. Squier in all that he states about reptiles, &c.

I now come to the remedy which I send you through Mr. Russell, and which is the air-root of a Philodendron (most commonly found in all our forests) pounded and infused in rum. A respectable old settler, by the name of Toussaint Ferrier, commonly known as "Old Solido," for upwards of forty years, living at Guayaguayare, near Point Galeota, at the south-eastern corner of this island, some time ago showed me this remedy. He himself and several of his sons had been more than once bitten by mapipires; the marks of the fangs were clearly shown to me on their legs and arms, and, in every case a complete cure was almost instantly effected by the use of this root. One of their dogs, whilst hunting, was also bitten by one of those snakes, and was already, to all appearance, at the point of death, when the remedy was applied, and the animal soon rallied, and was shortly "all right again." An old neighbour of "Old Solido," called Nelson, who had been bitten by a mapipire, and who, whether from disgust at the manner in which the remedy is administered, or from fear of the poisonous nature of the plant, had obstinately refused to try it, was saved, in spite of himself, by this specific. After having been for some time in a dreadful state of convul-sions, cramps, and vomiting, he at last fell into a state of collapse, and was dying fast, when "Old Solido" forced down his throat a large dose of his mixture, and also ap-plied some to the wound. It fortunately had the usual success. The dying man slowly but gradually rallied, and in the course of a few days got completely cured.

I could mention several other instances in which this root has really effected astonishing cures. In all the cases which I have quoted above, the snakes were killed immediately after inflicting the wounds, so that there can be no doubt whatever as to what species they belong. I am not aware that this specific has ever been tried for the bite of any of our other deadly snakes, such as the "cascabella" (*Trigonocephalus Jararaca*), and the "cora snake" (*Elaps corallinus*).

The manner in which it is used by "Old Solido" is as follows:—He cuts off from the lower end of one of the roots three small pieces, each about two inches long, bruizes it roughly with the handle of a cutlass, steeps it in urine, and administers it internally, at intervals of about twenty minutes each, in three doses of about a wineglass full each time, applying, at the same time, some of the mixture to the wound. Urine is probably used from its being always at hand, whilst spirits are not always to be got in the woods; but I suppose an alcoholic infusion of the root would do just as well, be-sides being less repulsive.

If you think that it is worth being tried scientifically in England, as I believe it really is, with a view to ascertain whether it might not be found successful against the bites of other serpents besides the mapipire, I hope you will be good enough to originate the neces-sary experiments. For my part I shall be most happy to send you, if wanted, any quantity of samples of the article which you may require for the purpose.

It having been already demonstrated, if I mistake not, that the virus of infectious fevers is closely approximat-ing to snake poison, may not this root prove useful also in some variations of typhus and other fevers participating of a putrid character?—I am, &c., SYL. DEVENISH, *Sec. of Trinidad Corresponding Committee of the Soc. of Arts.*

Port of Spain, Trinidad, 23rd April, 1866.

Patents.

From Commissioners of Patents' Journal, September 7th.

GRANTS OF PROVISIONAL PROTECTION.

Agricultural implements—2076—J. Halliwell.
Armour plates, jointing and connecting—2038—J. Benson.
Bale fastenings—2117—A. V. Newton.
Banding or twine, manufacture of—2074—E. Whalley.
Battens—2102—J. Cooper.
Beds for horses, &c.—2130—T. Henderson.
Bevel wheels, forming teeth of—2010—P. Murray.
Boiler tubes, fastening—2082—A. V. Newton.
Bridges, construction of—2022—E. Lamb.
Bricks and tiles—2081—E. Page.
Bottle-stoppers, securing—2134—C. Bathoe.
Buckles—2057—W. E. Gedge.
Buckles—2122—B. F. Weatherdon.
Carbonates, bi-carbonates, and insoluble silicates of soda, potash, and muriatic acid, obtaining from chlorides of sodium and potassium—2026—W. E. Newton.
Cartridges, central fire, for breech-loading fire-arms—2126—J. Abraham.
Caustic soda, producing from common salt—2077—S. Rowbotham.
Carding engines—1998—G. T. Bousfield.
Chains, flat-linked—2012—W. Hartcliffe and T. H. Lee.
Churns—2000—J. G. Avery.
Coal-wagons, wheels of—2103—H. A. Bonneville.
Colouring matters—2153—H. Caro.
Cotton, &c., carding—1988—C. N. Plantrou.
Cotton, cleaning and preparing—1296—F. Waddington.
Doors, &c. (sliding) working with spring rollers—2089—H. J. Petty and C. F. Sayer.
Drilling machines—2087—S. Alley.
Elastic fabrics—2100—W. Shaw and J. Connell.
Envelope and paper bag making—2049—J. Gathercole.
Envelope-making—2056—A. V. Newton.
Envelope and paper-making—2109—D. Rolls.
Explosive shells—2058—L. E. Williams.
Fatty and oily matters, treating—2110—G. Payne.
Fence-posts, moulds for casting ground-screws of—2060—M. A. Muir and J. McIlwham.
Fibrous materials, combing—2155—W. Tongue.
Filamentous materials, combing—1266—A. Morel.
Files and rasps, cutting—1992—W. Furness and W. Bray.
Fire-arms, breech-loading—2016—T. Wilson.
Fire-arms, breech-loading—2073—W. E. Newton.
Fire-arms—2113—W. Tranter.
Fire-arms, breech-loading—2143—J. C. R. Isherwood and R. Warry.
Fire-arms, breech-loading—2159—S. A. Main.
Fire-escapes—1990—E. Lamb.
Fishing apparatus—2008—W. H. K. Mack.
Flocks, manufacture of—2132—W. Greenwood.
Floor-cloths, ornamenting—2149—J. Longbottom.
Fountains, raising apparatus for—2167—E. Rimmel.
Fountains—2169—A. Long.
Garden-seats, awnings for—2042—E. H. D. Inge.
Gas, manufacture of—2067—J. I. Ensley.
Gas meters, wet—2047—J. Turner.
Glass, moulding—1994—J. T. H. Richardson.
Glass, printing on—2040—G. Davies.
Guns, conversion of muzzle-loading to breech-loading—2135—J. Darby.
Guns, manœuvring—2139—R. A. E. Scott.
Hammers—1986—S. Chatwood and J. and T. Sturgeon.
Hammers, direct acting tilt—2070—R. Leigh.
Hat-stretcher—2173—W. Bayne.
Horse-shoes—2080—W. E. Gedge.
Hydraulic engines—2014—W. Jackson.
Inorganic glyceric ether—2115—A. Paraf.
Iron and steel manufacture—2101—J. Cameron.
Irish moss and sea-weed, pulverising—2148—W. Weild.
Jacquard machines—2050—J. Brown and J. Hiton.
Jute, treatment of—2046—A. Oldroyd and P. A. Godefroy.
Knives and forks—2075—H. Sanderson.
Ladies' dress suspenders—2004—J. Whittaker.
Lamps—2032—G. Warriner and W. H. Stallard.
Lamps—2147—J. S. Nibbs.
Lamps, consumption of smoke from—2096—C. Brown.
Lathes, chucks for—2036—W. E. Newton.
Marble, cutting and grinding—2092—W. Brookes.
Mattrasses, &c., stuffing for—2118—J. H. Johnson.
Metals, coating—2095—J. Webster.
Mills, portable—2142—W. E. Gedge.
Motive-power—2030—G. Zanni.
Motive-power, obtaining—2137—J. H. Johnson.
Musical instruments and notation—2054—W. Clark.
Nail-making—2144—W. E. Newton.
Needle gun—2065—H. G. Craig.
Nitrous gas, condensation of with chlorine—2114—E. T. Hughes.
Oils, distillation and rectification of—2145—W. E. Newton.
Ordnance—1996—W. E. Newton.
Ordnance—2133—W. Weldon.
Ordnance—2146—J. Whitworth.
Ores, pulverising—2024—J. H. Johnson.
Paper-bag making—2129—J. S. Blockey and J. Hervey.
Pickle piercer—2098—J. W. Hoffmann and G. R. Wilson.
Pipes, earthenware, &c.—2059—C. F. Cotterill.
Portable lanterns—2028—G. B. Windle.
Presses for printing date on railway tickets—2086—J. B. Edmondson and J. Carson.
Projectiles—2124—R. A. E. Scott.
Puddling furnaces—2119—W. Clark.
Pumps—2091—E. W. De Rusett and R. F. Dale.
Railway brakes—2111—J. Helly.
Railway-carriages dispensing with turn-tables—2150—R. Wappenstein.
Railways, permanent way of—2019—P. M. Parsons.
Railways, permanent way of—2120—A. Berhard.
Railway signals—2094—T. Fleet, W. Payne, and F. Rock.
Railway trains, communication between passengers and guards and driver on—2163—W. Harrison.
Reaping machines—2165—P. V. Bailleul.
Reaping machines—2108—W. Smith.
Rotary steam-engines—2048—G. B. Harkes.
Saddles—2055—J. Clay.
Safes, fire and thief-proof—2152—H. R. Minns.
Safety guages—2161—J. A. Coffey.
Saw frames, applying motive power to—2044—J. Robinson and J. Smith.
Screw stock—2979—R. Bagley.
Self-raking reaper—2154—F. Howard.
Sewing machines—2053—C. T. Judkins.
Sewing machines—2069—E. A. Cowper.
Sewing machines—2136—W. Taylor.
Signals—2085—W. J. Current.
Ships, armour plated—2151—J. M. Hyde.
Ships' boats, detaching—2093—H. B. White.
Ships' rudders—2104—W. Clark.
Shuttle distributor for fringe machinery—2061—B. Donnet.
Slubbing and roving frames—2131—S. R. Platt and E. Hartley.
Smoke-prevention—2072—D. Marchal.
Stamps for producing impressions—2063—J. Collins and A. B. Campbell.
Steam-engines—2127—J. Varley.
Steam-pumps, direct-acting—2088—R. J. Worth.
Steam roller for agricultural purposes—1280—W. H. Crispin.
Submarine rakes—2171—J. Johnson.
Telegraphic cable—2052—W. R. Lake.
Textile fabrics, calenders used in finishing—2078—R. Wilson and W. Martin.
Textile fabrics, waterproofing—2084—C. F. Baxter.
Thermometers and pyrometers—2068—B. F. Weatherdon.
Washing machines—1887—W. Burgess.
Water, filtering and purifying—2125—G. E. Moore.
Water, purification of—2107—A. Kuhne.
Wood, preserving—2034—J. N. Browne.
Wool-combing—2128—S. Mortimer.
Woven fabrics—2090—J. A. Turner.
Yarns and fabrics, a green colour for dyeing and printing—[illegible]—J. A. Wanklyn and A. Paraf.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Eyelet-making machines—2250—G. T. Bousfield.
Rotary steam engine—2270—G. White.

PATENTS SEALED.

702. J. G. Willans.
722. T. Restell.
737. R. A. Boyd.
738. M. P. W. Boulton.
740. P. H. Ashberry.
744. T. A. Mathieson.
754. J. Jessop & W. Warburton.
767. E. W. Bunnett.
792. T. Sagar and G. Keighley.
837. C. Rosière.
838. M. Henry.
919. C. Pardoe.
1104. A. V. Newton.
1529. C. Brautigam.
1550. N. Brand.
1785. A. V. Newton.

From Commissioners of Patents' Journal, September 11th.

PATENTS SEALED.

755. G. Booth.
756. J. F. Brinjes.
759. J. Elder.
776. B. W. Selby.
777. J. Cole.
779. T. G. Ghislin.
780. W. Hutchinson & F. Jolly.
781. F. H. Gossage.
785. W. Bates and F. Bates.
789. J. H. Johnson.
799. F. Hinton.
806. T. G. Sylven.
812. T. Routledge, T. and W. Richardson.
839. W. E. Newton.
850. J. H. Burton.
907. T. Storey & W. V. [illegible]
917. H. E. Newton.
941. E. Brooke.
993. J. B. Fuller.
1007. J. Foster and J. Hollinshead.
1011. W. Clark.
1338. O. Brothers.
1937. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2177. N. Bailly.
2184. C. G. Kelvey & W. Holland.
2209. R. A. Brooman.
2203. L. Mond.
2206. W. A. Wilson & J. Smith.
2207. J. Burch.
2056. C. G. Wilson.
2161. J. H. Banks.
2213. W. H. Tucker.
2232. H. and J. W. Wright, and W. Clough.
2228. E. Oliver and G. Myers.
2233. M. A. Muir and J. McIlwham.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2059. J. G. N. Alleyne.
2036. E. Blake.
2106. J. Bottomley and A. A. Martin.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 21, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is ow published, and may be had *gratis* on aplication to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society f Arts, the Worshipful Company of Coach and oach Harness Makers offer a prize of £3 in 'reehand Drawing, and a prize of £2 in Practical Iechanics, to the candidates who, *being employed* ı *the coach-making trade*, obtain the highest umber of marks, with a certificate, in those ıbjects respectively.

Proceedings of Institutions.

Newton Heath and Failsworth Mechanics' Instiıtion.—The inaugural address on the opening of the inter session of this Institution was delivered on Wedısday, September 5, by Dr. Pankhurst, in the lectureıom of the Institution. The chair was occupied by r. Elijah Dixon, President of the Institution, who iefly opened the proceedings. Dr. Pankhurst said the ·eat object of education was to make the most of ımanity, to enfranchise men from external and internal ›ke, and put them in full possession of whatever might ılp them towards a higher progress. In that ministry progress they had distinct stages, of which mention ight be made. There was first the necessary knowlge coming after long labour and waiting; there was xt the knowledge by added thought turned into wer; and, finally, there was the power transmuted to help and happiness. Of those great laws of special ıelioration it would be very easy to discover illustraıns in every department and region of human activity. ɘ would, however, take one that would be sure to come me to all present. Let them consider from that int of view that great monument of energy, enterise, and skill—the cotton industry of Lancashire. ɘ would mention three statistical facts recently rnished by Mr. Platt, of Oldham. It appeared, the first place, that a pair of self-acting mules one thousand spindles—requiring the attention of ly one man and two boys, could produce in one ɛek more than 21,000 miles of yarn; that, in the next ıce, from the 36,000,000 spindles constituting the total ımber at work in Great Britain there was produced ,000,000 miles per day, or a length four times round ɘ earth per minute; and that, lastly, the £200,000 ɹrth of cotton yarn in 1760 had been in 1860 raised to 5,000,000. How were these results produced? They ɹre, in the main, the creatures of the conjoint operation the three great laws just stated. But there was one ing which presented itself to them of striking educaınal importance. Though there was no industry in ıich changes and improvements had been so numerous and rapid, yet the early and comparatively rude agencies of the first inventors—of Paul, of Arkwright, and of Hargreaves—rested upon and revealed substantially the leading principles which shone forth so eminently, and wrought so productively, in the last and latest improvements. This fact was of the utmost importance. Here they had in large illustration the great all-pervading truth that, though forms were transient, principles were eternal; therefore he who was master of the principles could command forms and manifestations at his will. From a single bone, found in some far-off cave, the naturalist, they knew, could re-construct the animal of which it formed a part; and from a flint hammer the antiquarian could infer the history and civilization of the men that used such instruments. In like manner a single fact, such as any one of those already mentioned, would be enough to evidence the greatness and power of the cotton manufacturers. Compare, then, the amount of work of one mule with the result of the labours of a number of the inhabitants of our extensive empire. In the action of principles, then, there was seen the highest results produced by the application of thought and mechanical power under the conditions of simplicity, specialization, and directness. But it would be little, in view of the present purpose, to say that principles were permanent and powerful, if yet it remained to be discovered how those principles were to be secured. But if the leading principles upon which the great process of industry and the arts depended were conspicuous for anything, it was for their accessibility. Whatever might have been the difficulty of the discovery in the first instance, when once established they became accessible to all. Nature herself stood ready to be interrogated of her choicest secrets, and any secret once known, even by only one man, became, on easy conditions, the property of all mankind. It was only necessary to begin at the beginning, to pursue the study of them earnestly, steadily, continuously, and here he might say patience was a sure prophecy of success. At that point it became a duty to exhort the students attending the classes of that Institution, and through them all the students of their union, to master the elements, for the elements were at once the first beginnings, and the last results of every science. It was in, and through, and by them that all the rest came. Processes of thought at first found practically impossible were subsequently performed in the first instance with difficulty and slowly, but repeated trials made them at last easy, rapid, and even instructive and pleasing. Above all, he would urge them to remember the great and inspiring effects of a high and settled purpose. Purpose was power. Such a purpose would constitute a perpetual and presiding energy—a constant power of selection, appropriation, and guidance. High principles and purpose gave a clearer view of the end, opened up a wide estimate of the means, and brought the latter to their fullest efficiency, by always keeping them in due relation to the former. In the result he would say that, though the friends of the students could and did sympathise with them, and offer them all encouragement, yet they would have to leave them there; they could only attend them to the gates of the arena. When once there the success of the student could alone depend upon themselves—upon the might of their energy, and truth of their devotion. He wished that the students should find a type of their object and procedure in that symbol of stability and power—the great ocean itself, which, though as to its surface is tossed with endless activity, as to its depths abides unmoved in calm eternal stillness.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(Concluded from page 677).

SPANISH.

THREE HOURS ALLOWED.

FIRST CLASS.

1. Render into Spanish the following passage:—

After Don Quixote had satisfied his hunger, he took up a handful of acorns, and, looking on them attentively, gave utterance to expressions like these:—"Happy times, and happy ages, were those which the ancients termed the golden age! not because gold, so prized in this our iron age, was to be obtained, in that fortunate period, without toil; but because they who then lived were ignorant of those two words, 'Mine and Thine.' In that blessed age, all things were in common to provide their ordinary sustenance; no other labour was necessary than to raise their hands and take it from the sturdy oaks, which stood liberally inviting them to taste their sweet and relishing fruit. The limpid fountains and running streams offered them, in magnificent abundance, their delicious and transparent waters. In the clefts of rocks, and in hollow trees, the industrious and provident bees formed their commonwealths, offering to every hand, without interest, the fertile produce of their most delicious toil. The stately cork-trees, impelled by their own courtesy alone, divested themselves of their light and expanded bark, with which men began to cover their houses, supported by rough poles only, as a defence against the inclemency of the heavens. All then was peace, all amity, all concord. The heavy coulter of the crooked plough had not yet dared to force open and search into the tender bowels of our first mother, who, unconstrained, offered, from every part of her fertile and spacious bosom, whatever might feed, sustain, and delight those, her children, by whom she was then possessed."—*Cervantes.*

2. Translate into English the following:—

Mandaron á un estudiante yendo á cazar que no hablase porque espantaria á los conéjos; y dijo cuando los vió, Ecce caniculi multi. Y como se espantasen y le rineesen, respondió:—? Quien habia de pensar que los conéjos sabian latin?

En una almoneda de los bienes de un mercader que debia mucho dinero, uno compró un colchon diciendo, que era bueno para dormir, pues *dormia* en el, hombre que debia tanto.

El Marques de Cortés decia que él que carecia de amigos, era como panal sin miel, espiga sin trigo, ó árbol sin fruto.

3. Explain the following idioms and proverbs:—

Al primer tapon zurrapas:—
Puesto en cuclillas;
El dar limosna, nunca mengua la bolsa.
El poco hablar es oro, y el mucho lodo.
El vino que es bueno, no ha menester pregonero.
En tu casa no tienes sardina, y en la agena pides gallina.

SECOND CLASS.

1. Translate into English the following extract:—

Acabó su historia aquel ladron, y comenzó otro la suya, diciendo que él era hijo de un mercader de Burgos, y que en su mocedad, llevado de una indiscreta devocion, habia tomado el hábito de cierta religion muy austera, de la cual habia apostatado algunos anos despues. En fin, todos los ocho ladrones habláron por su turno, y cuando, los hube á todos oido, no me admiré de verlos juntos. Mudaron luego de conversacion y propusiéron varios proyectos para la proxima campana, sobre los cuales tomáron su resolucion, y se fueron á la cama. Encendieron bujias, y cada uno se retiró á su cuarto. Yo seguí al capitan Rolando al suyo, y mientras le ayudaba á desnudar. Ahora bien, Gil Blas, me dijo, ya ves nuestro modo de vivir. Siempre estamos alegres. Entre nosotros no se dá lugar al tedio ni á la envidia. Jamás se oye aquí discordia ni disension estamos mas unidos que frailes. Tú comienzas ahora, hijo mio, á gozar una vida muy agradable, pues no té tengo por tan tonto que te dé pena el vivir entre ladrones.—*Le Sage.*

2. Point out the irregularities of the verbs *dormir* and *ir*.

3. Write the plural number of the following nouns:—*Bajá*, *aleli*, *rondó*, *fisú*, *café*, *canapé*, *pié*, *maravedí*.

4. Do the words *caos*, *génesis*, *nada*, *infanteria*, *caballéria*, *egoismo*, *vandalismo*, admit of a plural?

5. Point out the gender of the following nouns:—*Planeta*, *sistema*, *sofisma*, *patriarca*, *sátrapa*, *tapaboca*, *poeta*.

THIRD CLASS.

1. Translate the half of the extract from "Gil Blas" (*Vide* Q. 1, Second Class).

2. Answer the grammatical questions (Ibidem).

3. Translate into Spanish the following phrases:—

Religion raises men above themselves; irreligion sinks them beneath the brutes: this binds them down to a poor pitiable speck of perishable earth; that opens for them a prospect to the skies.

Every person, whatever be his station, is bound by the duties of morality and religion.

We should implant in the minds of youth such seeds and principles of piety and virtue as are likely to take the deepest root.

FREE-HAND DRAWING.

THREE HOURS ALLOWED.

Candidates are not required to do more than one of the following subjects:—

1. Make a drawing of the time-piece as large as you can, on half a sheet of imperial paper.

2. Draw from knowledge the front view of a head looking up, and a head looking down, both the size of life.

3. Make a design illustrative of your occupation, and explain the subject in writing at the bottom of your drawing.

DIRECTIONS FOR THE LOCAL BOARDS.

Place a handsome time-piece on the chimney-piece of the room in which the candidates are to draw; or, if the chimney piece be in a dark or inconvenient part of the room, let the time-piece be raised on a table four feet from the ground.

GEOMETRICAL DRAWING.

THREE HOURS ALLOWED.

The constructions must be accurate, and show clearly, by plain and dotted lines, with appropriate letters of reference, the principles on which they are based. They may be put in ink or left in pencil, at the discretion of the candidate, provided they are distinct.

No deviation from the conditions of the questions can be admitted; and since no candidate must answer more than one question from any one section, he is advised not to attempt more than the time will admit of his completing, since little or no credit will be given for incomplete or inaccurate constructions.

I.

Construct a triangle from either of the following conditions:—

1. Its sides as 2 : 2·5 : 3 and circumscribing a circle of ·75 inch radius.

2. Its sides in the same ratio but inscribed in a circle of 2 inches radius.

3. Isosceles, its sides touching two circles in contact of 1 and ·5 inch radii.

II.

Construct a triangle from either of the following conditions:—

1. Its sides as 2 : 2·5 : 3, its area 4·5 square inches.

2. Equilateral, its area equal to a rectangle of 3 and 2 inches side.

3. Its base 3 inches, its vertical angle 40°, and its sides as 2 : 2·5.

III.

1. Inscribe a circle in a sector of 70° and 2·5 inches radius.

2. Describe a circle of 1·5 inches radius to touch a circle of 1 inch radius and a straight line 1 inch distant from this circumference.

3. Two concentric circles are 1 and 1·5 inches radii, draw a chord of the outer circle so that it may be divided into three equal segments by the circumference of the inner one.

IV.

1. Construct a quadrilateral A B C D, its sides A B = 2·5; B C = 3; A D = 4 inches, its diagonals at right angles, A C being 4 inches.

2. Construct a quadrilateral equal to the above in area, but its perimeter the least possible.

3. Construct a regular pentagon of 6 inches area.

V.

1. Three lines, each 3 inches long, meet in a point, each being at right angles to the other two; draw their plan when one is inclined at 25°, another at 50°.

2. Three indefinite planes are at right angles to each other and touch a sphere of 1 inch radius resting on the paper, one plane is inclined at 50°, another at 70°, show their intersections (or traces) with the paper, and mark the points in which they touch the sphere.

VI.

1. A square, of 2·5 inches side has its centre and two corners 3, 2·5; 3·5 inches above the paper; draw the plan of it and an elevation on a plane parallel to either diagonal.

2. Three corners A, B, C of a regular pentagon of 1·75 inch side are 1; 1·5; 2·5 inches above the paper, draw its plan and add an elevation on a plane parallel to the diagonal A C.

3. Draw the plan of a circle of 1·5 inch radius when two tangents to it which are at right angles are inclined at 30° and 40°.

VII.

A pyramid 4 inches high, has a regular pentagon of 1·5 inch side for its base, draw its plan when it is in one of the following positions:—

1. Lying on one face on the paper.
2. When the plane of one face is vertical.
3. When the planes of two faces are vertical.

VIII.

1. A cylinder 2·5 inches in diameter and 3 inches long, is terminated by a cone, 2 inches high, the two solids having a common axis, draw the plan of them when a straight line on the conical surface is either vertical or horizontal.

2. If the cylinder of the last question is cut by a plane making an angle of 70° with its axis, and passing through a point in the circumference of one end, draw the development of the surface cut off.

3. A sphere of 1·5 inch radius rests on the paper, and a cylinder of 2 inches radius also lies on the paper, and touches the sphere, draw their plan and mark the point of contact.

IX.

A box 28 inches long, 12 wide, and 9 inches deep in the clear, bottom and sides ·75 inch thick, is divided into two by a cross partition, and one of these divisions is again divided into two equal parts, these partitions being ·25 inch thick and their tops to be ·75 below the upper edges of the sides and ends—

1. Show this box in isometrical projection to a scale of $\frac{1}{4}$.

2. Show it in perspective, the eye being 5 feet from one corner and 2 feet above the plane of the top, the plane of the picture touching one upright edge, but equally inclined to front and end.

THEORY OF MUSIC.

THREE HOURS ALLOWED.

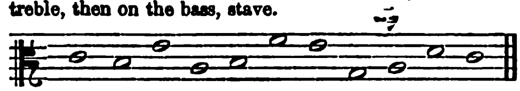
I. RUDIMENTS OF MUSICAL GRAMMAR.

(*Nos.* 1 *to* 4 *must be answered* on music paper, *and in the order in which they are put.*)

1. Transpose the following a third higher.

2. Write the pluperfect fourth or tritone, in the scales of *Do* (C), *Re* (D), *Mi b* (E♭), *Fa* (F), *Sol* (G), and *La b* (A♭).

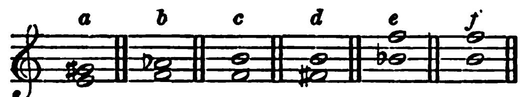
3. Write the following (at the same pitch) first on the treble, then on the bass, stave.



4. Write, from memory, any short tune, or passage of melody, with which you are acquainted.

5. How does the minor always differ from the major scale; and in what respects are the two sometimes alike?

6. Name the intervals formed by the following.



7. In what scale or key is the following?

8. How do *a* and *b* differ? Give the time signature of each.

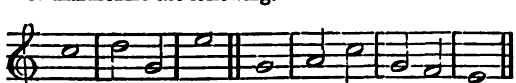
II. HARMONY, COUNTERPOINT, AND MUSICAL HISTORY.

(*Nos.* 1 *to* 3 *must be answered* on music paper, *and in the order in which they are put.*)

1. Add three parts to the following.

2. Add a part or parts, in any kind of counterpoint, to the following.

3. Harmonize the following.



4. Explain why *a* is in a good position and *b* in a bad one.

5. What is meant by a dissonant interval?

6. Give the rules for resolving a seventh, an imperfect fifth, and a ninth.

7. What notes of a scale are most often used as roots or fundamental basses?

8. Name the most distinguished composers of the modern German school, and state anything you know about their lives and works.

PARIS EXHIBITION, 1867.

A distinct order of reward of a novel character, consisting of ten prizes of £400 each, has been announced by the Imperial Commission, and British competitors for the rewards are to send in their claims on or before 1st November next, in order that, if the claims appear suitable, they may be transmitted to the International Jury, which it is announced will meet on the 1st December, 1866. These rewards are "in favour of the persons, establishments, or localities which, by a special organisation, or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen." Besides these rewards, there are twenty "honourable mentions." Moreover, one grand prize of 100,000 francs (£4,000) in addition may be awarded "to the person, establishment, or locality distinguished under this head by a very exceptional superiority."

Three jurors are assigned to the United Kingdom, and their names will be shortly announced.

The works in the Champ de Mars are proceeding with great rapidity; the whole of the framework of the iron portions of the building may now be said to be completed, and the outer circle which masks all within, the *grand nef*, as it is called, and which is to form the machinery and processes court, including in the latter manual as well as mechanical labour, presents a very bold and commanding appearance. There is little or no ornamentation connected with this exterior circle, or rather zone of the building, but its huge sides of plate iron, eighty feet high (walls there are scarcely any apparent), look light and elegant, in consequence of the clerestory, or range of windows, in three compartments, with arched tops, which occupy all the upper portion between the great pillars of the inner as well as the outer side. This *grand nef* is nearly a mile round, more than a hundred feet in width, and eighty in height, and will certainly form one of the noblest exhibition galleries ever constructed; the roof being unpierced, and the light coming in from the upper part of both sides, give this noble court an importance, as regards appearance, which a glass roof would be far from producing; there is plenty of light, without the cold or hot glare of a glazed covering. The clerestory, as already stated, occupies the whole of the upper portion of the sides; the corresponding spaces below are filled in with brick and plaster work, and in front is the alimentary court, in which all the cafés, restaurants, and other places of refreshment are to be placed; beyond this again is a jutting roof, forming a covered promenade, twenty feet wide, open to the park all round this outer circle of the exhibition. The grand nave is being rapidly covered in, and a large number of the window frames, the only portions of the zone which are in cast-iron, are in their places; when viewed from the park, beyond the gigantic proportions of this great court, its curved outline, and the fan-like appearance of the *marquise*, or verandah, produce an admirable effect, and show how much may be done without any extraneous ornament, by the mere repetition of simple elements, when good proportions are maintained throughout. The Commission has wisely determined not to mar the symmetry of this outer face of the building by any attempt at architectural effect in the way of porticos; there will probably be an entrance to the park of an ornamental character on the side of the quay, and opposite the main door of the building, and there will be many elegant structures in the grounds themselves, but these will all be at a sufficient distance from the building itself not to produce an unpleasant contrast with its bold, simple features.

The inner zone of the building, divided into two courts, a wide one for the Fine Arts, and one of smaller dimensions for the retrospective museum, or gallery of the *Histoire de Travail*, is, as has before been stated in the *Journal*, formed of solid stone walls, with partly-glazed roofs. The whole of the masonry has been finished for some time, many of the sections into which these two courts are divided are roofed in, and some have the glass in its place and the walls plastered. The *salles* of the Fine Art gallery, which occupy the straight sides of the building, are noble rooms, admirably lighted, but those which occupy the circular ends, and which form by far the largest portion of the whole, will give, we fear, great dissatisfaction, the walls presenting curves of small radius, the light falling in the most perplexing manner. In this inner zone of the building the curved form is a sad mistake. Between the great outer portion and the inner zone which we have just described, are the intermediate galleries, to be devoted to raw materials, furniture, clothing, ornaments, hardware, and all the remaining classes of the catalogue; the light cast-iron columns and partially glazed roofs here present a very pleasing effect, and the curvature of this portion, from its larger radius and the absence of division walls, improves its appearance. These intermediate courts are the most advanced of all; the roofs are being glazed, the louvre boards are in place, and in a few weeks they promise to be ready for the exhibitors.

The central garden, like the exterior of the building, will have an iron *marquise*, or verandah, all around it, but in a different style. This is nearly finished, and consists of a light and elegant cast-iron facia, supported by slender columns, whose plinths rest on steps raised above the garden level.

A large number of buildings are rising up in the park. In the first place there is a very large plain building, of three stories, on one side, communicating with the park as well as with the road without; this is to be devoted to the use of the juries, and probably in part to that of the Imperial Commissioners also. This building has been covered in for some time, and will shortly be entirely finished. At the opposite end of the park, near the quay d'Orsay, is another large building, not so far advanced, which is for the purpose of a club, to include all the ordinary features of such an establishment as far as they may be required for its temporary purpose, and also a large exchange or hall, for the use of exhibitors and those with whom they have business to transact. In another part, again, is a small ecclesiastical edifice, of which the roof is now nearly completed, and which is intended for the exhibition of all kinds of church furniture and decoration, interior as well as exterior. With this view the model church is provided with a transept, an apsis, a number of small chapels, and a profusion of windows. The admirable idea of thus forming a court in which all objects of ecclesiastical use or decoration may be exhibited in an appropriate setting, is said to have originated with M. Leveque, a well-known artist in stained glass, of Beauvais, who, with the sanction of the Imperial Commission and the aid of exhibitors and others, has raised this model Gothic church, which covers a thousand square yards of ground, and which, no doubt, will glisten next spring in all the splendour and with all the taste for which French artists, decorators, church jewellers, and others are so conspicuous. It is an excellent idea, likely to be well carried out.

Amongst the auxiliary buildings, erected or in course of erection, is a water tower for the supply of the building, steam engines, cascades and fountains, and two engine houses, pretty constructions in brick, with ornamental tiled roofs.

A kiosque is also being constructed, by order of the Sultan, who, it is said, will visit the Exhibition.

Another building is to be raised by order of the Viceroy of Egypt, to contain a large number of copies of the most celebrated monuments of that country, besides other objects of art and curiosity.

In one corner of the park considerable works are going on for the formation of the horticultural and piscicultural exhibition, which will form a large garden, with cascades and aquariums on a large scale.

Outside the precincts of the Exhibition, the railway station of the line which will lead direct to all parts of Paris as well as bring into communication all the lines starting from the city, is nearly completed, and the railway works in connection with it are under hand; the bridge over the opening made in the Quai d'Orsay, which will afford a direct entrance to the park from the landing place on the bank of the river is constructed, and the ornamental portions are now being completed; and lastly, the large space of ground in the Isle St. Germain, intended for agricultural experiments and other subsidiary purposes, is levelled and arranged. This ground is about a mile distant from the Exhibition.

Amongst the features talked of, but whether decided upon we are not informed, is the formation of a terrace on the top of the *grand nef* of the building, with ascent and descent by means of hydraulic lifts, from which a bird's eye view may be obtained of the park and the surrounding country.

The publication of the catalogue has been ceded to M. Dentu, the well-known bookseller of the Palais Royal, for the sum of £20,320; the catalogue is to consist of twelve parts, the first to contain the plans, tables, and documents relating to the exhibition; the second is to be devoted to the history of labour, or retrospective museum; and the remaining parts to the ten great groups into which the general contents of the exhibition is to be divided. The entire work is to be sold for five francs, and the separate parts at half-a-franc each.

The lists of intending exhibitors in many of the classes are now complete, and some idea may be formed of the show which will be made on the French side of the Exhibition. Classes 14 and 15 united, artistic furniture, upholstery, and decoration, numbers 220 exhibitors; class 17, porcelain, faïences, and other artistic pottery, 96 exhibitors; class 18, carpets, tapestry, and other tissues for furnishing purposes, 62 exhibitors; class 21, goldsmiths' work, 30 exhibitors; class 22, bronzes, fine iron castings, and repoussé work, 101 exhibitors; class 26, objects in fine leather and basket-work, and other small wares, 90 exhibitors; class 27, cotton fabrics and threads, 241 exhibitors; class 32, shawls, 28 exhibitors; class 34, hosiery, linen, and small articles of dress, 170, exhibitors; class 35, clothing, 215 exhibitors; class 36, jewellery and other ornaments, 153 exhibitors; class 39, toys and other small wares (*bimbeloterie*), 16 exhibitors; and class 46, leather, skins, and furs, 84 exhibitors; class 52, prime movers, generators, and machinery specially adapted to the purposes of the exhibition, 12 exhibitors; class 54, tool-making machines, 111 exhibitors; class 58, materials for and processes connected with furnishing and fitting, 41 exhibitors; class 59, paper making, dyeing and printing of fabrics and tissues, 80 exhibitors; class 60, machines, instruments, and processes of ordinary trades, 52 exhibitors; and class 62, saddlery and harness, 41 exhibitors. The classification differs so much from that of the former Universal Exhibition held in Paris, that of 1855, that it is impossible to make a comparison of the numbers; in the former there were only 27 classes, not including the fine arts; in the latter there are 96 classes, or, excluding the fine arts, 91. If we take the twenty classes of which the number of exhibitors are given above, as a fifth of the whole, we shall arrive at nine or ten thousand, which is little short of the total of 1855, which was 10,950, without Algeria and the colonies; there is no doubt, however, that the exhibition will be far in advance of its predecessor; and if, as is understood, the admission juries have, in accordance with the principles laid down by the Imperial Commission, set up a much higher standard of admission than formerly, a diminution of the number of exhibitors will be an immense advantage in every respect. It may be taken for granted that there will be no space to spare on the French side of the exhibition, and that the quality will be in keeping with the quantity. In looking over the lists many important names are not missing, and certainly the trades for which Paris and its neighbourhood are celebrated will be well represented. The same remark applies to those great industries, such as the cotton and hosiery trades; and there is no doubt that, whatever may be the number of exhibitors, the productions will show not only a considerable advance since 1855, but even since 1862. Since the preceding was written the list of admitted exhibitors in the class of manufacturing machinery has been inspected, and it appears that they amount to very nearly four hundred, and include the first firms in the empire.

The Imperial Commission attaches great importance to the tenth and last group in the classification adopted, namely, that which has for its object the improvement of the physical and moral condition of the population. The group is divided into seven classes, devoted to:—Materials and methods of infant education; books and materials for adult education; furniture, clothing, and food, distinguished by utility combined with cheapness; popular costumes of various countries; specimens of cheap, convenient, and healthy houses; productions of all kinds, manufactured by working men, having their own shop, and only assisted by their own family or one apprentice; and tools and methods employed by these little masters; forming together a complete economical exhibition.

As regards the products of master workmen, the Imperial Commission desires to see represented an important phase in the life of working men—that in which a man has arrived by his talent to the position of small master, and may hope at some future day to be at the head of a large establishment.

The class will include all kinds of productions, the only general characteristic being the conditions of their productions. Working men in visiting exhibitions have often seen the admiration of the public excited by the productions of their own hands, but which bore no trace of their name, and regretted that they could not exhibit objects conceived and executed at their own homes; or rather, perhaps, it should be said, that special facilities were not afforded them for that purpose; the Commission has therefore created a class in which every object shall be the production of an artizan, with or without the aid of his family and an apprentice, either for regular trade or sale.

In other classes of the exhibition the articles will be showed under the name of the manufacturer who has arranged for their production and assured their execution, but in the class under notice every article will reveal the hand of the actual producer.

Many small masters, who work at home for manufacturers, have feared to give offence to their employers by exhibiting on their own account, but the new classes introduced into the programme of the coming exhibition have been sanctioned by the manufacturers who take part in the management, so that it is hoped all jealousy will be done away with; and the object in view has been made known by various means of publicity in all parts of the empire, and special committees have been formed in the Departments, as well as in the capital, to carry out the project.

The productions in question are to be submitted to five committees of admission, and the whole of the articles accepted for exhibition will be exhibited previously, and privately, in the *Palais de l'Industrie* in the Champs Elysées, the Imperial Commission bearing the expense of their display in the preparatory exhibition

but the exhibitors paying for their own fittings in the Universal Exhibition itself. In order to make place for this preliminary exhibition, and for other operations connected with the exhibition, the collection of Algerian and colonial products, and all the fittings used for the exhibition of cattle, are now being removed from the building in the Champs Elysées. The offices of the Imperial Commission are at present in this building, and some departments will be retained there during the whole time of the exhibition, and this, with what we have stated above, shows how valuable it is to have such an edifice always ready for exhibitions of moderate extent, or for the preliminary and supplemental service of a great exhibition like that of the coming year. It should be mentioned, too, that in order to assist working exhibitors as much as possible, it is arranged that, in case of large articles, a deputation from the committees of admission will examine them in the workshop of the producer.

The works of fine art intended for the exhibition of 1867, limited to such as have been produced since 1855, are also to be collected in the Champs Elysées building, by or before the 15th of October; the jury of admission will commence its examination on the 10th of November, and announce its decisions by the end of the year. Great dissatisfaction has been caused by the very early dates fixed for this examination, as the works received for exhibition will thus be lost to their owners for twelve months, and it is feared that these regulations will have a damaging effect on the art portion of the exhibition; certainly five months seems a long period for selection and arrangement.

As regards foreign countries, much of the anxiety that was felt a short time since has passed away. It is certainly to be feared that the manufacturers of Bohemia, Moravia, and other countries, will not make such a show as they would have done had not the war interfered with all their operations, but both Austria and Prussia have supplied the Imperial Commission with the plans of their space and the list of their exhibitors.

As regards Spain, the government has formally announced its intention to take part in the exhibition, and has supplied its plan and a list of exhibitors, and intends to erect in the park some structures of considerable extent and importance. The Spanish Commission has issued pressing circulars to the local representatives on the subject.

The war in Italy will probably have an unfortunate effect on her manufacturers, but the Italian Commission has furnished the design for the façade of its portion of the building, and is about to commence its constructions in the park.

Switzerland is expected to be very well represented. Its section will be characteristically decorated with a façade in ornamental work, composed of pine wood, and bearing the escutcheons of the twenty-two cantons. She will have, amongst other things, curious archæological and ethnographical collections, and a complete series of the picturesque costumes of the country.

Egypt will present a very remarkable exhibition; a quadrangular building, with a colonnade all round, about 85 feet long by 60 broad, is being raised in the park, and will contain some of the most curious objects of art and antiquity in the country. This building will be a reproduction of the Ptolemaic temple dedicated to Hothor, with the greatest possible exactitude in all the details, and the execution of it has been entrusted to the learned Mariette Bey. Amongst the most interesting monuments and representations to be exhibited are—Ceremony of offerings to the gods, by Ptolemy; an authentic likeness of the famous Cleopatra, found by Mariette Bey last winter in a cavern at Denderah; bas-reliefs of various handicrafts, classed according to date; artistic representation of the epoch of the pyramids; the bas-reliefs from the tomb of Phtah hotép (Saqquarah), representing the deceased surrounded by his people, hunting scenes, combats of lions and buffaloes, fêtes and dances; bas-reliefs from the tomb of Ti, with scenes of rural life and labour; representation of various trades and arts, the navigation of the Nile, and other subjects, under the various dynasties; reproductions of the famous bas-reliefs and paintings of the Temple of Abydos, with a number of original statues and works of art, coffins and other objects. In addition to this large building, there will be two others illustrative of modern Egyptian life—one representing the habitation of a fellah of upper Egypt, with a small establishment for artificial hatching, a stable of dromedaries armed and caparisoned for war, and other animals, and an ethnographical collection; the other a horseshoe-shaped kiosk, in the purest Arab style, surrounded with plants and flowers of the country.

Outside of the kiosk native Egyptians will be seen practising the trades of the present day. In the interior of the kiosk will be a divan for the Viceroy of Egypt, who is expected to visit the exhibition, and an Oriental café, furnished with all its accessories. In the court will be a large plan, in relief, of the whole of Egypt, executed by order of the Viceroy, and under the direction of Colonel Mircher, the chief of the French mission in Egypt, and in the centre a fountain, composed of the alabaster of the country.

It will not be out of place to conclude this notice of the coming exhibition with the results of an inquiry into the sanitary condition of the mass of workmen employed on the works on the Champ de Mars. It appears that there has been no great agglomeration of population in the neighbourhood. Down to the 1st of April the number of persons employed did not exceed 800, but since that period it has increased to 1,477. Of these 472 live in distant quarters of the town, 300 belong to the establishment of Mar, Cail and Co., and make part of the resident population of the quarter in which the works are situated, and that of the whole number only 438 form an addition to the neighbourhood. The lodgings of these last have been frequently visited, and found to be in a satisfactory condition as regards health; and as the greater portions of these men are masons, whose work is finished, 300 of them have already been discharged. The result is that the accumulation of this large number of men on one spot has not given rise to any notable change in the condition of the quarter. This enlightened watchfulness for the well-being of the labouring classes reflects great credit on the authorities, and offers a valuable hint to those other places where large undertakings interfere with the temporary or permanent condition of the district.

BRITISH ASSOCIATION, 1866.

On a Proposed Use of Fluorine in the Manufacture of Soda. By Mr. Walter Weldon.

The following paper was read in the Chemical Section:—

The members of the Chemical Section are sufficiently familiar with the fact that when two equivalents of sulphate of sodium are treated with one equivalent of hydrochloric acid, one equivalent of the sulphate is converted into bisulphate and the other equivalent transformed into chloride. I am not aware, however, that any one had noticed, until I did so myself, that when sulphate of sodium is similarly treated with hydrofluoric acid a precisely similar reaction occurs, half the sulphate being converted into bisulphate and the other half transformed into fluoride. Now, among the differences between chloride of sodium and fluoride of sodium there is one which from a soda manufacturer's point of view is all-important, chloride of sodium requiring for its conversion into caustic soda a series of operations, one of them involving the intervention of a strong acid, whereas fluoride of sodium is convertible into caustic soda by one operation only, consisting simply in boiling with lime or with any one of several other metallic oxides. Upon this fact of the re-action between sulphate of sodium and

hydrofluoric acid thus yielding, without any destruction of sulphuric acid, a compound as readily caustifiable as carbonate of sodium itself, I believe it will prove practicable to base a manufacturing process by means of which soda shall be produced, not only, if not exactly without the use, at any rate without any consumption of sulphuric acid, but actually without the consumption of any materials whatever excepting salt and coal, all the re-agents employed being recovered for use over and over again continually. The first operation consists in the production of sulphate of sodium by double decomposition between chloride of sodium and sulphate of magnesium having associated with it at least one atom of water, the products, besides sulphate of sodium, being magnesia and hydrochloric acid; the second operation consists in treating the sulphate of sodium so obtained with hydrofluoric acid, thereby producing fluoride of sodium and bisulphate of sodium; the third operation consists in decomposing the fluoride of sodium obtained in the second operation by means of the magnesia obtained as one of the results of the first operation, and so obtaining caustic soda and fluoride of magnesium; and the fourth operation consists in the decomposition of the fluoride of magnesium thus produced in the third operation by means either of the bisulphate of sodium obtained in the second operation, or of its second equivalent of sulphuric acid separated in any convenient way, with re-production of sulphate of magnesium, with which to repeat the first operation, and of hydrofluoric acid with which to repeat the second operation. All the reagents employed for the transformation of salt into soda by this method are thus continually reproduced, the only materials consumed being the salt and a comparatively small quantity of fuel.

The second of the four operations thus described is remarkable, not only as transforming sulphate of sodium into a readily caustifiable compound without destroying its sulphuric acid, but also as not requiring any fuel at all, the reaction between sulphate of sodium and hydrofluoric acid taking place at ordinary temperatures. The sulphate of sodium and the hydrofluoric acid having been put together in a suitable vessel, which may be made of either lead, gutta percha, vulcanised india-rubber, or wood impregnated with paraffin, a little brisk agitation is all that is necessary to cause the reaction to be completely effected within a few minutes. On their being left at rest, the fluoride of sodium settles very readily, forming a dense precipitate, only slightly retentive of liquid, and admitting of the supernatant solution of bisulphate being separated from it very completely and with great ease. The third operation requires some fuel, but not much, the caustification of fluoride of sodium by means of magnesia, though requiring some special arrangements and precautions, being almost as easy as the caustification of carbonate of sodium by lime; and the fourth operation requires even less fuel than the third, the decomposition of fluoride of magnesium by sulphuric acid taking place, though perhaps not quite quickly enough, at ordinary temperatures, and proceeding with great rapidity when the temperature is only moderately raised. The only one of the four operations which requires nearly as much fuel as either of the furnace-operations of the ordinary soda process is the first operation. That operation may be performed either in the dry or in the wet way, either by heating a mixture of the two salts, or by dissolving them together and cooling the solution to about 24° Fah., by means of either Carré's machine or Kirk's machine, or any other convenient contrivance for producing artificial cold. It is somewhat easier to avoid loss of sulphuric acid when the decomposition is effected by the latter method than when it is effected in the dry way, and, as far as I can ascertain, the cost for fuel, labour, and wear and tear, of affecting the decomposition by means of Carré's machine is not only not greater, but it is somewhat less, than the cost for fuel, labour, and wear and tear, of a corresponding furnace operation. When, however, the decomposition of the chloride of sodium by sulphate of magnesium is effected in the wet way, there is required a further operation, consisting in evaporating the mother-liquors to dryness and heating the residue, in order to effect the decomposition of the hydrated chloride of magnesium, of solution of which the mother-liquor chiefly consists, into hydrochloric acid and magnesia. This further operation, however, only increases the total number of operations to five, or to just as many as are required for the conversion of salt into caustic soda by the ordinary process, the manufacture of the sulphuric acid used in the latter process being counted as one of the operations of it; while these five operations require so much less time than the operations of the ordinary process, that by this hydrofluoric acid process large charges of salt may be converted in caustic soda, in solution, within as little as from two to three hours. As compared with the process at present in use, therefore, the proposed process has the advantages of occupying less time, of requiring less labour, less fuel, and a far less costly plant, of producing no useless residue, and of consuming neither sulphuric acid nor lime. In fact, as I have said, the new process produces caustic soda without consuming anything whatever excepting salt and coal.

Having thus described a fluorine soda process which is practicable now, I proceed to a very brief mention of a shorter and simpler process, which, although it is not quite in perfect shape at present, I have fair reason for anticipating that I shall be able to carry out on a manufacturing scale at no distant date. Of all conceivable soda-processes, probably the simplest is that which would consist in decomposing chloride of sodium by means of steam, with production at one operation of caustic soda and hydrochloric acid. That reaction is practicable enough on the small scale, but there are difficulties in the way of carrying it out on the large scale which have hitherto proved insuperable, and which one can scarcely even hope to see overcome. Some, at any rate, of these difficulties, however, do not obtain as regards the decomposition of fluoride of sodium by means of steam, and for my own part my experience of this reaction has convinced me that its accomplishment on the large scale presents no difficulties which a little further persevering endeavour may not fairly be expected to overcome. In that case, the number of operations required for the transformation of salt into soda by way of the intermediate production of fluoride of sodium will be reduced to three, of which the first will consist in the production of two equivalents of sulphate of sodium by the reaction between one equivalent of chloride of sodium and one equivalent of bisulphate of sodium; the second operation, consisting in the production, by treating the two equivalents of sulphate of sodium thus obtained in the first operation with one equivalent of hydrofluoric acid, of an equivalent of fluoride of sodium, for conversion into caustic soda, and an equivalent of bisulphate of sodium, with which to repeat the first operation; and the third operation consisting in the decomposition by means of steam of the fluoride of sodium obtained in the second operation, with production of caustic soda, and reproduction of hydrofluoric acid, with which to repeat the second operation.

The hydrofluoric acid, whether produced by the reaction of steam on fluoride of sodium, or by that of sulphuric acid on fluoride of magnesium, must be condensed in a coke-tower, like that which is ordinarily used for the condensation of hydrochloric acid, but lined with either lead, gutta-percha, or wood impregnated with paraffin, or any other substance upon which hydrofluoric acid has not much action. When the hydrofluoric acid is obtained by means of sulphuric acid, it flies off at so low a temperature that its condensation is much easier than that of hydrochloric acid as at present ordinarily obtained; but when the hydrofluoric acid is produced by means of steam, it requires about the same amount of condensing power as is ordinarily needed for hydrochloric acid.

Lastly, it may be interesting just to mention that

fluoride of sodium can be produced by acting with hydrofluoric acid directly upon chloride of sodium itself. When strong hydrofluoric acid is added to a saturated solution of chloride of sodium, the whole instantly becomes milky-looking, and there is gradually formed a precipitate consisting of fluoride of sodium mixed with chloride of calcium and fluoride of magnesium if any chloride of those metals was present with the salt, a quantity of hydrochloric acid equivalent to the fluorides formed being produced at the same time. By this method, however, only a part of the chloride of sodium is transformed into fluoride, but a much better result is got by passing hydrofluoric acid gas into the solution of chloride of sodium, care being taken first to cool the gas, and not to pass it in too rapidly; and there is reason to expect that by proceeding in this way, and by adopting other precautions, it will prove possible to convert chloride of sodium completely into fluoride.

The consumption of sulphuric acid in the British soda manufacture during the current year will probably amount to over 350,000 tons, the consumption of limestone to over half a million tons, the consumption of coal to about one and a quarter millions of tons, and the production of useless residue to at least a million and a half tons. The suggestion embodied in this paper, while preventing the production of any useless residue whatever, would save all the sulphuric acid, all the limestone, and probably half the coal, besides effecting other important economies. Before the next meeting of the British Association comes round I trust that the practical realisation of the suggestion will be an accomplished fact.

SUGAR CULTIVATION IN ENGLAND.

The following is from *Travers' Circular*:—When we regard the gradual introduction of beet sugar into so many European States, the question naturally occurs to us, how is it that in Great Britain alone, of all the great commercial nations, the culture of the beet should be unattempted. The European beet crop has now reached almost gigantic proportions, and this year amounts to no less than 600,000 tons. In France, the cultivation of the beetroot constitutes one of the most important and most remunerative articles of agriculture. An extent of land, equal to about 300,000 acres, is assigned for its cultivation; it keeps 468 manufactories at work; it gives employment to 70,000 hands, involving an expenditure of about one million sterling for labour each season, at a period of the year when more than at any other time employment is needed by the agricultural classes; it enriches the land in which the beet is sown, to the extent of at least 30 per cent., increasing the corn crops, and the number of the animals grazing on the pasture lands. In Austria, a country formerly dependent upon Holland for its supply of sugar, sugar cultivation is extending; and though the introduction of the beetroot dates only from the year 1830, there were, before the commencement of the recent war, 140 sugar manufactories at work, and employment given to 40,000 labourers of both sexes. Holland has recently entered on the same course, finding it profitable to cultivate beetroot sugar, even though she possesses sugar-producing colonies of her own. The great success of this trade in Prussia, the original home of beetroot sugar, and in the rest of the Zollverein, is well known. According to a statement in Mr. Baruchson's pamphlet, there are even in Spain as many as twelve manufactories devoted to the manufacture of beetroot sugar. It is somewhat curious that, whilst enumerating the various countries that are supposed to be favourable to this cultivation, Mr. Baruchson finds no corroboration for his statement in the most recent official report on the subject—the answers drawn up by the Secretary of Legation at Spain in reply to questions addressed by Her Majesty's Government last year, whether sugar were cultivated in that country. In this report no mention whatever is made of the existence of beetroot manufacture, and the reader is left to infer that the whole amount of sugar in that country during the previous year, 1864, 20,000,000 quintals, was produced solely from the cane plantations in the Spanish colonies, Cuba and Porto Rico, although it is well known that cane sugar is cultivated near Malaga.

There is not much perhaps that could be urged in praise of our fiscal system, but at least the cultivation of the beetroot, if once it were undertaken, is never likely to suffer from such capricious and arbitrary regulations as those which accompanied its development in France. The most important fact in considering the sugar question in England, is that so far as cultivation goes, the beetroot is grown very largely all over Great Britain, and that the question of the extraction of sugar is not one of possibility, but of expediency. Mangold Wurzel is nothing but the common field beet, and contains from 4 to 7 per cent. of sugar; and the question is whether it would be commercially profitable to extract this product instead of giving it to animals. In considering the matter practically, it must not be forgotten that the pulp left after extracting the sugar is used on the Continent for exactly the same purpose as the whole root is with us. The question therefore is simply whether the value of the sugar extracted from the root would not more than repay the loss of weight for animal feeding. Certainly, if we may judge by France, it would be profitable, for the French farmers in the last crop are stated to have made a profit of 33 per cent. The mangold wurzel is not so rich as the Silesian beet, which contains about 10½ per cent. of saccharine matter. This plant is, however, simply a variety of the beet, and there is no reason why it should not be tried in England. In regard to the question, whether the Silesian beet or the mangold wurzel would be preferable, it is stated that the mangold wurzel, though poorer in sugar, is more productive as a plant. In the north of France the produce of the beet crop is stated by Mr. Baruchson to be, for a good average, 40 tons of root per hectare, or about 16 tons per acre, and that gentleman also confirms M. Payen's assertion that 5,000 tons of root produce 300 tons of sugar and 60 tons of molasses. The experiment of growing beet for the extraction of sugar was tried some years since in Ireland, but was abandoned, we believe, principally from the idea that beet sugar could not in the long run compete with cane. Since that time, however, beetroot has made immense strides, and the process has been so much improved that the yield from a given quantity of root has been doubled.

The obstacles that at first sight seem to oppose its introduction into Great Britain do not appear to be either fiscal or physical. In venturing an opinion, however, on a subject purely economical, and in which the relative advantage of growing one crop or another is influenced by the value of land or the price to be obtained by the crop, we speak under correction; and with the most diffidence, as the question of its possible manufacture in this country has perhaps never been discussed by one in a thousand of our landowners. Apart from the value of the article itself, the collateral advantages are hardly of inferior consequence, in the employment it affords in winter, at a time of the year when labourers are plentiful, and in the benefit it confers upon the soil in which it is grown. In many of our English counties mangold wurzel is so extensively grown that there would seem to be every opportunity for ascertaining the commercial success of this experiment, but in Ireland, circumstances would appear to be even more favourable to its growth. "The very circumstance," says Mr. Baruchson, "which is supposed to render Ireland not so fit as other countries for the growth of corn, makes it on that account peculiarly suited for the growth of crops which are cultivated on account of their bulbs, stems, and roots." That Ireland, which is subject to a greater amount of moisture than any other country where corn is grown, would seem adapted by nature itself for the successful cultivation of the beet. It is even stated by some that the

rield in Ireland would be at least half as much more ær acre as in France, owing to the more favourable haracter of the soil, and the equally beneficial influence f a liberal expenditure of British capital. One special ecommendation of the beetroot cultivation is that there s no part of this plant which is not capable of being tilized in some way or other for the service of man. Ind in corroboration of our remarks, we point to the ollowing striking passage from the able pen of M.)ureau, the editor of the *Journal des Fabricants de Sucre*, uoted by Mr. Baruchson in his pamphlet:—"The beet-oot, besides producing 200,000 tons of sugar in France, roduces at the same time a mass of pulp beneficial to griculture, which, excluding even all other food, is able o nourish, during one year, 50,000 head of cattle, or 00,000 sheep. The manure produced by these animals, dded to the other residues of sugar manufacturers, can ertilise every year 20,000 hectares, or 50,000 acres. he 420 (since increased to 468) manufacturers now aking sugar, employ from 60,000 to 70,000 hands, epresenting an outlay of not less than £800,000 to 1,000,000 for labour during each season. The 300,000 cres on which the beetroot is now planted were once illow grounds, or unfertile soil. The crops of wheat, r from being diminished, have increased in an equal itio. No other part of France produces more cereals than he north, and this is the very country where beetroot is ıltivated to the greatest extent. Everywhere, after the ıltivation of beetroot, the land has yielded one-third eavier crops than previously; thus, in manufacturing ıgar, bread and meat are also increased, contributing ırgely to the public alimentation." The beet gave the asis for the succession of crops which was before anting in France, but as we have carried out this ystem for many years, the results on the land would ot be so surprising as in France. Considerations such s the above are, however, of sufficient weight and im-ortance to invite the earnest attention of all interested ı the sugar trade, and the general agriculture of the ountry. We do not pretend to give an opinion as to ie practicability of making the extraction of Sugar om the beet commercially profitable, as a result can lone be arrived at by actual experiments. It would, owever, appear that the question is well worth the ttention of our farmers.

Fine Arts.

Local Art Exhibitions.—The importance of these chibitions in France has frequently been mentioned in ie *Journal*, and the report of that which took place at ordeaux, in the present year, shows once more the ılue of such exhibitions. The collection included 632 orks, and was open for eight weeks. There were 10 works for sale, and 115 found purchasers; the ıthorities of the town bought two paintings for the cal museum; the private purchases amounted to 75, ıd a sum total equal to £1,318, although the sales fell f during the latter half of the period in consequence of ıe disquieting news of the war in Germany. The ociety, under whose management the exhibitions take ace, bought 38 works, and the total proceeds of the hole of the sales reached £2,210. This was the teenth exhibition of the Society, and the total sum tained by sales amounts to £26,911. The Society ceives assistance of various kinds from the Emperor, e Minister of State, and the authorities of the Depart-ent and of the town. It is agreeable to know that is local encouragement of art owes much to an English nnoisseur, lately deceased, Mr. Scott, English Consul Bordeaux, and President for several years of the Society question. Another of the principal local exhibitions, at of Rouen, is about to open shortly, and an exhibi-ɔn of works of the old masters, interrupted by the rrible ravages of the cholera, will take place shortly at miens.

Discovery of a Picture by Ary Scheffer.—The other day, in examining the canvasses rolled up in the stores of the Louvre, a fine work by Ary Scheffer, which was supposed to have been destroyed at St. Cloud, in 1848, was discovered. The picture represents Louis Philippe on horseback, and surrounded by all his sons, and is considered to be the finest work of its class produced by the famous painter of Faust and Margarite and the Mignons. Ary Scheffer, it is well known, was a great favourite and almost intimate friend of the Orleans family, and was their companion when they left the Tuileries at the time of the Revolution.

Manufactures.

Utilisation of Water Pressure in Towns.—The greater part of Paris is but a height of five to ten metres above the mean level of the Seine, and the zero of the scale of depths at the Pont Royal is at 24·47 metres above the level of the sea. The waters of the Dhuys, which should furnish 40 to 50 thousand cubic metres per day, are at a height of about 84 metres above the level of the Seine. The waters of the Vanne, which furnish about 100,000 cubic metres per day, are at a height of about fifty-six metres above the Seine. These considerable heights, which correspond to pressures of from five to eight atmospheres, proceed from natural levels, and are not due to the action of any artificial elevating power, The waters of the Seine, to be had almost everywhere, furnish from 100 to 200 thousand cubic metres per day at a height of 40 metres above the level of the Seine at Paris. The waters of the canal of the Ourcq furnish about 100,000 cubic metres per day, at a height of 27 metres above the level of the Seine; and finally, there are the two artesian wells of Passy and of Grenelle, from which the daily supply is about 9,000 cubic metres. If these several supplies are multiplied by their corresponding heights, a total force of 17,660,000,000 kilogrammes is arrived at, or equal to a continual and uninterrupted steam power during twenty-four hours of 2,725 horses. But as this expenditure of water is used almost only during the day, the available power during twelve hours would become 5,450. It is this enormous power, at present almost all lost, which M. Maldant wishes to see utilised, and of which the utilisation seems to him, in many cases, to present as many facilities as advantages. Making an approximate estimate of the water used, for household and other purposes, the general conditions of which do not admit of its being utilised; allowing for a loss of power, due to a mean height of flow of water above the level of the Seine; finally taking also into account various uses, such as public watering roads with a jet, where the pressure is partially turned to account, it must readily admitted that more than half or one-third of the power previously stated can be utilised. Under these reduced conditions there still remains at Paris from about 2,000 to 2,800-horse power, which may supply hundreds of small industries in rooms where motive power is necessary, and where the use of steam or gas motive power is almost impossible. This power might also be profitably employed for industries requiring rather a considerable but intermittent power, such as the hoisting of material for building purposes, the "lifts" in hotels, railway stations, &c. Water may be obtained in Paris by yearly payment, at about fifteen centimes the cubic metre. Supposing that water under a pressure of about forty metres, and working a motive power that utilises about 75 per cent. of its total power, it will be seen that for fifteen centimes of water 1,000 kilogrammes of material may be lifted to a height of 30 metres, or 2,000 kilogrammes to 15 metres. The cost of maintenance and of supply to the motive power is very small, and would be estimated at a high figure if put at an additional cost of one-fourth of the ordinary cost of the water.

African Ornaments.—The following is by Mr. W. C. Aitken, of Birmingham, and is extracted from a recently-published work on the industries of that district:—A considerable quantity of the brass wire made in Birmingham finds its way to the Gold Coast, to Old Calabar, in the form of what are called "guinea rods," one hundred of which, each three feet in length, of Nos. 4 and 5 gauge in thickness, packed up in deal cases, and being at their destination sold in exchange for palm oil, &c., are used as the "circulating medium" by the natives, and at the death of the possessor are interred with the body. An influential Birmingham merchant states the orders from that country frequently amount to from five to twenty tons each. Large numbers of rings made of solid brass wire, about seven-sixteenths thick and three-and-a-quarter inches diameter, are also sent to the Gold Coast. A smaller size of brass wire (a little thicker than ordinary pin wire) is converted by being wound round spits into spirals like an ordinary check bell spring, and is also exported to the locality named for purposes of ornament and personal decoration. To the West Coast of Africa the wire is sent in rods or straight lengths, and to the East Coast in rings or coils, where its purchase is monopolised by the Banyan or Arab merchants immediately on its importation—Zanzibar being the chief depôt. Wire of the No. 4 and 5 gauge is generally preferred. When sent into the interior, the large 50lb. coils are sold at prices from 50s. to 67s., and are divided into three or four rings called "khata," for convenience of carriage, and attachment to the "banghy," or carrying pole. Native artizans at Unyanyembe convert the wire into the coil bracelets, a "khata" or ring of wire being sufficient to form two or three of these ornaments, each of which weighs about 3lbs. The "katinda," or coil bracelet, is sold, when made, for one dollar (4s. 2d.) each. The katinda bracelets were formerly made of copper wire, but its cost has been the means of introducing brass wire instead. Though the East African can draw fine brass wire, they import it from Zanzibar into the interior. The gauges preferred are from No. 22 to 25; this they convert into a variety of ornaments.

Commerce.

Telegraphs in Russia.—According to the statement of Professor Youze, there were sent, in 1864, by Russian telegraphs, 680,000 messages to the interior of the kingdom, 160,000 international messages, and 88,000 for the service of the empire, in all 928,000 messages. The average cost per message, in round numbers, is two roubles. The total receipts have increased since 1860 in the following proportions:—

	Annual Receipts in Roubles.
1860	940,000
1861	1,177,000
1862	1,369,000
1863	1,534,000
1864	1,724,000
1865	2,000,000

This last amount is only approximate, but in all probability it has been considerably more. The total expenditure in the telegraphic department, with cost of construction, maintenance of the wires, and other expenses, excepting only the cost of laying new wires, was from 1860 to 1864:—

	Roubles.
1860	829,000
1861	1,020,000
1862	1,270,000
1863	1,500,000
1864	1,680,000

Since 1861 long and costly lines have been established, having a great political importance, but little productive in financial respects; for example, the line from Kazan to Irkoutsk and Kiatkha, about 4,000 versts in length, but touching no important town. In the following table will be seen the gross receipts, the expenditure, and the net receipts for a verst of telegraphic line:—

	Gross Receipts.	Expenditure.	Net Receipts.
	Roubles.	Roubles.	Roubles.
1860	37·07	32·69	4·38
1861	36·40	31·57	4·83
1862	37·62	34·85	2·77
1863	33·46	32·69	0·82
1864	30·57	29·68	0·89

The cost of maintenance, with necessary repairs, amounts to 10 roubles per verst.

Schools of Commerce, Belgium.—M. Penot, at one of the meetings of the Industrial Society of Mulhouse, gave a summary of the information that he has collected at Paris, Frankfort, and Antwerp, on the Schools of Commerce that are established in these places. The school of Antwerp has particularly been deserving of his attention. He devoted eight days to the inspection of this school, and in taking the opinions of all the principal merchants in Antwerp; and M. Penot states that this institution thoroughly accomplishes the end for which it was intended. The teaching is at the same time theoretical and practical; it lasts two years, at the end of which the pupils undergo a final examination, composed of oral and written tests. M. Penot shows, quoting some passages from a final prize composition, how solid is the knowledge that is acquired at this school. Deserving pupils are sent abroad for a year at the expense of the Belgian government, with the title of *élèves consuls*, with the obligation of sending every three months commercial and statistical reports.

Progress of Railways in Egypt.—The branch line between Damanhour and Seh-Ibrahim-Dezughi, passing the place that will unite Mehallet-Roh to the Mansourah to Lephté branch, will be opened soon for traffic. Soon also will be opened a direct branch from Cairo to Mansourah, a line that offers great facilities to communication. Other lines are in course of construction, and before long the principal places in Lower Egypt will be united by rapid and commodious lines of railway.

Colonies.

Land Act, Queensland.—There is much interest attached to the land measure expected to become law during the present sitting of Parliament. A Land League has been organised at Brisbane, to forward the popular idea of the best way of remodelling the land laws. At present the majority seem to wish for a leasing clause, to enable lands to be taken on long leases at low rates of rent. Another idea is the adoption of a homestead law, to allow those who own no land to take up from 25 to 160 acres, at 5s. per acre, and have seven years to pay that amount in. As no title would be given until the seven years had expired, and no other land could be bought by the homestead selector in the interval, jobbing and speculation are out of the question.

Butchers' Meat Trade, Brisbane and Melbourne.—A considerable trade is now being carried on between Brisbane and Melbourne in the article of fresh butchers' meat, which has of late—since the cold weather set in—been shipped in large quantities. This, with the quantity of preserved meat now manufactured and shipped, will have a beneficial effect on the cattle market. Fat wethers are worth from 10s. to 11s., and bullocks £4 10s. In Melbourne bullocks of the same size and quality are worth £13 to £15. Heavy draught horses are in good demand.

New Zealand Shipping.—During the month of May

51 vessels entered inwards at the port of Dunedin, measuring 10,742 tons; and 55 outwards, measuring 13,774 tons. The total immigration for the month was 372 males and 54 females, 14 boys and eight girls—total, 448. Emigration, 334 males, 99 females, 45 boys, and 30 girls—total, 508.

Telegraph in New Zealand.—The Government have invited tenders for steamers to assist in submerging the Cook's Straits Telegraph Cable, which is expected in the *Weymouth*. It has been stated the White Bay, near Picton and Lyal's Bay, at the port of Wellington, are the best points to land the shore end of the cable. Wellington will then be placed in direct communication with all the principal towns of the southern island.

Kerosene in New South Wales.—The manufacture of kerosene is now fairly established, and the local market will in future be to a small extent supplied with a local article. The existence in the colony of deposits of the kerosene-bearing cannel coal has been known for some time. Different varieties, of different qualities, have been operated upon. The richest coal is that found at Hartley, and this is now being successfully worked for the manufacture of oil. The crude oil is prepared from the coal by the process of retorting. At present only nine retorts are set up; they are producing at the rate of nearly 1,200 gallons per week, but they are not worked up to their full capacity. The refining power is at present equal to 10,000 gallons a week. To produce 10,000 gallons of oil it will require 100 tons of cannel of the richest of that found at Hartley, so that at this rate of consumption the supply in store will last for a long while. The seam there is thick, and a single acre will furnish mineral enough for a year's supply at the rate of 100 tons per week.

Stations in New South Wales.—There has been very little demand for station property during the past month. Choice fattening runs have been in demand, and anything of the kind would readily find buyers at full rates. The Bendemar Creek Station, in the Bligh district, was offered at auction, with 1,000 head of mixed cattle, and realized £3 5s. 6d. per head, the stores, stock, horses, &c., to be taken at a valuation. The Mount Connell Station, on the Burdekin River, Queensland, was sold, with 6,200 sheep and 750 head of cattle, for the sum of £8,000. Store cattle, there has not been much demand, and with the exception of one or two lots from choice Clarence River herds, no sales of importance have transpired. There will be considerable risk in droving cattle before spring sets in, notwithstanding the late rains, as there is but little chance of grass springing up during the winter.

Port Adelaide.—The value of the imports and exports at Port Adelaide during the present year, up to 23rd of June, was £1,267,202, against £1,281,063 in same period of 1865. The value of the exports was £998,395, against £1,197,681 in 1865, showing a decrease in the imports of £13,861, and in the exports of £199,286.

South Australia.—There is expectation of renewed efforts to explore "No Man's Land," and also of some attempt to open a track from Mount Margaret across the unknown region stretching into the neighbourhood of Shark's Bay. Major Warburton has again proceeded to Port August, with the view of again prosecuting the undertaking, if he finds that the appearance of the country will warrant the attempt. The present exploration is intended, in accordance with the instructions issued in 1864, to be confined within the boundaries of the colony. Major Warburton has twice attempted to force an entrance into "No Man's Land," but in both instances the want of water and bad state of the country compelled him to retreat.

New Zealand Gold.—The total export of gold from the province of Otago, from the time of the discovery of the gold-fields to the end of the year 1865, amounted to 1,875,053 ounces; the exports for the several years having been—1861, 187,695oz.; 1862, 397,602oz.; 1863, ...0,233oz.; 1864, 455,927oz.; and 1865, 253,696oz. Since the beginning of the year 69,784oz. have been exported, giving a total export since the discovery of gold of 1,999,531oz.

Forthcoming Publications.

Art-Journal Illustrated Catalogue of the Universal Exhibition, Paris, 1867.—The proprietors of the *Art-Journal* announce their intention to issue, during the year 1867, an Illustrated Catalogue of the principal objects of Art-manufacture contained in the Universal Exhibition of the Works of all Nations to be held at Paris. The work will be of a similar character to those issued by the *Art-Journal* in connection with the Exhibitions of 1851 and 1862. The Catalogue will probably consist of 1,000 engravings, and will form part of each current number of that journal, the cost of which will not be increased. It will be edited by Mr. S. C. Hall, who edited the Illustrated Catalogue which accompanied the *Art-Journal* in 1851, and also that issued with the *Art-Journal* in 1862. He will be aided by an experienced staff; and the proprietors anticipate that labour, energy, and liberal expenditure will secure excellence in the several departments of the work. The editor solicits early communications on this subject from contributors, British and Foreign. Editions of this Catalogue will probably be published in French and in German, as well as in English; and an edition will also be issued in the United States of America.

Notes.

Law of Copyright.—The *Publisher's Circular* observes that "where competition exists, the publishing of uncopyrighted books cannot be any more profitable than the publication of copyrighted books. The question of American books production, moreover, could not be affected in any way by the establishment of international copyright. With or without copyright, books for the American market will be produced where it is, on the whole, and taking into account both natural and artificial obstacles, cheapest to produce them. With a Copyright Convention, the people of Great Britain and the United States would, in fact, as far as authorship and bookselling went, be practically one community; and the grounds for maintaining the arrangement would be precisely the same as those which have always induced the legislatures of each country to confer copyright upon its own authors."

Experiment in Economic Building.—A house nine stories high, in addition to the ground floor and basement, is now being built in the Quartier du Roule, in Paris, as an economical experiment. There is no staircase to the building, the means of attaining the upper floors being by hydraulic apparatus, such as is in use for building purposes, two large square tanks alternately filled with water, which serves as a counterpoise to the weight to be be raised. These tanks, which will carry an enclosed room with seats, are to move up and down once in a minute, and thus convey the occupants and their visitors up and down without fatigue, noise, or dust. It is calculated that, with this arrangement, the upper floors, from their superior airiness and prospect, as well as from their freedom from noise, will command higher prices than the others. The same means of mounting by hydraulic power is being adopted, it is said, in the new buildings in the Bank of France.

Cultivation of Roses.—It is well known that the rose gives rise to an important trade. The rose tree is regularly grown; it is generally a very productive cultivation. There are fields of rose trees in certain parts of France as there are fields of turnips elsewhere. The number of rose trees thus cultivated is taken at 500,000 for Orleans, 200,000 for Metz, 1,000,000 for Angers,

1,500,000 for Lyons, 2,000,000 for Paris, 2,000,000 for the thirteen communes of Brie-Compte-Robert. The varieties called tea rose, the Bourbon, and Mousseuse answer particularly well in Orleans and in the environs of Paris.

Correspondence.

Chemical Laboratories.—Sir,—I have read with much pleasure the interesting abstract which has appeared in your *Journal*, of Dr. Hofmann's report to the Department of Art and Science, respecting the magnificent, I may say royal laboratories now being built in Prussia; I therefore hope you will excuse my troubling you with the following remarks, but the subject is so important that it deserves not only the attention of the Council of the Society, but its leading members; for no society in the United Kingdom has a better position, and commands more respect and influence than our Society, consequently it is its duty to take the lead in all matters that can promote art and science amongst our working and intelligent population. Although the Society has done much of late years to promote those branches of learning, having been the originator of universal exhibitions, and of local and national examinations, still I am of opinion that they should go a step further, and give a substantial help to those young men to whom it has awarded medals or honours, by enabling them to complete their studies in those branches of science for which they have shown an aptitude. I would therefore suggest that the Society should establish a laboratory, in which young men who have obtained honours might manipulate for say a year, so as to complete their knowledge of chemistry, and thus enable them to obtain good situations in our manufactories, and become useful managers or members of the same. There are at the present day but few branches of trade or manufactures in which a knowledge of chemistry or natural philosophy is not essential. Further, such a laboratory could be used by the members of the Society for pursuing experiments or researches in which they might be interested. Lastly, it would enable the Society to have not only courses on special subjects in the various departments of science, but it could then establish consecutive and complete courses of lectures, in which the elements of science and its various applications could be blended together, and thus become practically and generally useful to the members.—I am, &c., A Member.

Patents.

From Commissioners of Patents' Journal, September 14th.

Grants of Provisional Protection.

Alcoholic liquids, manufacture of—2204—H. A. Dufrene.
Ammunition balls, preventing oxidation of—2215—W. E. Newton.
Boilers, cleansing flues of—2184—E. Green.
Boot-polishing apparatus—2200—E. Lamb.
Carriage axles—2226—J. Richards and R. Grindle.
Carriage-breaks—2203—C. E. Brooman.
Cartridge-cases—2222—W. T. Eley.
Cartridge-case extractor for breech-loaders—2227—T. Turner and W. Siddons, jun.
Chimney-pots or terminals—2208—J. Proctor.
Churns—2198—G. Haseltine.
Coffee-roasting—1756—S. A. Hodd and W. Upton.
Eggs, preserving—2172—W. E. Newton.
Embroidering machinery—1736—W. Clark.
Fabrics, folding—2175—R. Tonge.
Fermented liquors, preserving—2241—H. E. Newton.
Fire-arms, breech-loading—2196—E. Brooks.
Fire-arms, breech-loading—2209—T. W. and W. Barber.
Fire-arms, breech-loading—2231—W. E. Newton.
Fire-arms, breech-loading—2243—A. Albini and F. A. Braendlin.
Fire-arms and ordnance, breech-loading—2205—W. Krutzsch.
Floor-cloths—2180—F. H. Danchell.
Furnaces—2062—W. Mosley.
Gas, purification of—2201—W. Pierce.
Hats, &c., felting—2194—W. Clark.
Hydraulic pumps—1516—E. T. Bellhouse and W. J. Dorning.
Hydrostatic scales—2041—W. Clark.
Kilns, lime and cement—2179—P. A. De Berenger.
Lifting-jacks—2233—S. B. Simon.
Locomotive engines for steep inclines—2174—J. B. Fell.
Looms—2212—R. Buckton.
Looms—2229—J. G. Tongue.
Matches, cutting splints for—2166—T. Allen.
Metallic pistons—2178—J. Booth.
Motive-power—2164—A. Gerrard.
Motive-power engines—2011—C. and J. Pratt.
Muffs, combined with bags, &c.—2232—J. Loebl and J. [illegible]
Organs, pianofortes, and melodeons—2181—W. E. Newton.
Packing for steam-tight joints—2064—J. E. Keirby.
Paper-hangings—1447—P. M. Balin.
Pulleys for hanging balance sashes—2216—H. Morgan.
Punching and rivetting machines—2158—R. H. Tweddell.
Railways and engines—2189—W. D. Gainsford.
Railway breaks—2219—J. H. Johnson.
Railway rails—2214—G. H. Bovill.
Railway signals and permanent way—2160—J. Livesey & J. Edwards.
Railway waggons, unloading—2193—S. Plimsoll.
Reaping and mowing machines—2182—E. T. Bousfield.
Reflectors—1541—E. P. H. Vaughan.
Saws, sharpening—1984—J. Parry and R. Morris.
Shawls, mantles, &c., fringing and trimming—2202—J. Northrop.
Sheep, dipping mixture for—2225—J. C. Dickinson.
Ships' propellers, prevention of fouling by ropes—2211—R. H. Hudson.
Shot-proof structures—2223—T. Whitby.
Slate-cutting—2192—G. Hunter and W. F. Cooke.
Smoke-consuming heater—2002—G. W. Fair.
Spool tubes and cartridge-cases—2213—J. Forster.
Steam-engines—2199—C. T. Porter.
Steam generators—2239—R. Daglish.
Steam-valves—2207—J. Farmer.
Sulphide of sodium, production of—1355—W. Weldon.
Tin drums for spinning machinery—2188—G. Little.
Urinals, water-closets, and taps—2183—J. G. Jennings.
Ventilating apparatus—2206—T. Davis.
Vessels and ships—2191—J. O. York.
Vessels, propelling and steering—2237—W. Clark.
Water, purification of—2218—R. Irvine.
Water, purification of—2230—J. Davies.
Wool, balling—2228—W. C. Brookes.
Wool-combing—2190—G. T. Bousfield.
Yarn and thread, winding—2176—H. Wren and J. Hopkinson.

Invention with Complete Specification Filed.

Leather, manufacture of—2325—E. Fitzhenry.

Patents Sealed.

787. T. J. Reader.
788. A. Pilling.
790. E. R. Wethered.
795. R. Badger.
797. R. H. Ashton.
798. J. Heaton.
807. E. Beacher and J. Gillott.
811. E. Field and F. Lloyd.
813. C. S. Osborne.
814. A. A. Croll.
816. H. King.
823. B. Swain and P. Oldfield.
830. F. P. Warren.
832. S. Dalby.
847. J. Jackson.
852. J. Macintosh.
863. C. E. Amos and W. Anderson.
866. B. Berry, jun., and G. Bromley.
869. F. A. Calvert.
876. J. Medhurst.
882. T. Silver.
893. W. E. Gedge.
950. G. Haseltine.
963. M. Henry.
973. G. Muller.
994. J. Patterson.
1223. C. D. Abel.
1318. G. T. Bousfield.
1348. A. V. Newton.
1360. W. Clark.
1518. G. T. Bousfield.
1817. W. Thompson.
1861. W. Thompson.

From Commissioners of Patents' Journal, September 18th.

Patents Sealed.

818. R. A. Jones and J. C. Hedges.
821. W. Naylor.
824. T. N. Kirkham, V. F. Ensom, and H. Brook.
825. P. G. B. Westmacott.
833. H. Stead.
834. C. E. Brooman.
836. C. H. Parker & H. Rossell.
842. E. D. Elliott.
843. S. Chatwood, J. and T. Sturgeon.
849. R. A. Hardcastle.
856. T. E. Symonds.
857. M. Archdeacon.
858. W. Whittaker & W. Lees.
865. T. Ironmonger.
895. J. Bracher.
930. G. Hindshaw.
935. J. J. Derriey.
939. G. Turner.
978. C. J. Vishoff and J. A. Matthiessen.
1003. G. Davies.
1031. G. A. Ermen.
1103. A. Turner.
1476. G. Green.
1649. G. T. Bousfield.
1821. A. V. Newton.
1986. W. E. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

2238. L. Desens.
2261. G. Howell.
2262. W. Thompson.
2328. G. T. Bousfield.
2267. J. Cox.
2287. P. McLaurin.
2272. B. J. Webber.
2299. H. W. Hart.

Patents on which the Stamp Duty of £100 has been Paid.

2080. J. Mason.
2213. W. Hartley.
2113. J. Luis.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 28, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade*, obtain the highest number of marks, with a certificate, in those subjects respectively.

Proceedings of the Society.

CANTOR LECTURES.

"On the Synthesis and Production of Organic Substances and the Application which some of them Receive in Manufactures." By Dr. F. Crace Calvert, F.R.S., F.C.S., &c.

Lecture I.

Delivered on Friday, April 13th.

"On the Synthesis of Organic Substances."

The Council of the Society of Arts having again conferred upon me the honour of delivering a course of lectures on chemistry, I have deemed it advisable to lay before the members of this influential and eminently useful Society a branch of investigation and series of facts different entirely from those which I have examined on two former occasions. My first course had reference principally to the properties, the manufacture, and the application of certain classes of organic substances derived from or relating to the animal kingdom. I tried, at the same time, to impress upon the minds of my hearers the importance of studying chemistry in connection with those branches of manufactures; and I further attempted to effect this by drawing attention to the recent improvements which chemistry had introduced; and there are, no doubt, many more improvements that science will develop in process of time. My last year's course was conceived with a view of impressing on the minds of those fond of scientific pursuits the necessity of studying chemistry not only as a separate branch of learning, but in its obvious and intimate connections with nearly every other class of scientific investigation, such as physiology, geology, mineralogy, agriculture, natural philosophy, &c. The present course has been planned with the idea of giving an insight into that modern branch of science called organic chemistry; to show the valuable and interesting results arrived at by chemists in that department, and to impress upon my hearers the great advantages that society will derive from the progress of these researches, not only in a scientific point of view, but also as bearing upon manufactures and arts; for the manufacturers of the present day are not confined to the employment of mineral matters only in their productions, inasmuch as organic chemistry has placed at their disposal many useful substances which were quite unknown half-a-century ago, and no doubt many more will be brought to light by men of skill and research as their investigations proceed. This will, however, depend much on the progress of that science itself, which will show to chemists and manufacturers how to obtain from cheap and refuse matters substances which have a value; or, in other words, to produce artificially substances which now exist and are found in the organised kingdom, but the extraction of which is always costly and difficult, owing to the fact that the substance sought for is mixed with a variety of other substances which must be eliminated or destroyed before those substances, the properties of which are useful, can be made available. I shall, therefore, in this course of lectures, try to illustrate by facts the broad statement that science has enabled men already to produce artificially substances which may truly be called organic; and if science has already arrived at this triumphant result—I say "already," for organic chemistry barely dates fifty years back, and we all know that the first steps of a science are the most difficult and first principles require the greatest effort of the human mind to unravel — if in this short space of time we have succeeded in obtaining a great number of facts by which certain laws have been revealed to us, we have reason to expect and hope that the next fifty years will bring facts and results to light which shall be as profitable, and I may say as astounding, as those which have been discovered of late years by the means of chemistry, and which have guided manufacturers to many very important applications.

Thus the volatile products obtained from coals were first employed as an illuminating agent. Science and application have gradually brought that illuminating agent to a high state of perfection, and have shown the most economical way of employing it, and the best means of availing ourselves of its illuminating power without interfering with the health and lives of those by whom it is used. Thereby a cheap and effective illuminating agent has been secured to society. At the same time as these volatile and gaseous products are generated, water containing various substances is produced, and science having ascertained their nature, we find them converted into alums, sulphate of ammonia, and other commercial products extensively used in agriculture and in manufactures. Further, a dark, noisome, sticky product called tar is also extracted, which at first used to be the great hindrance to gas-light manufacture. This product having been examined and studied by chemists, a most valuable series of substances has been gradually extracted and applied to useful purposes. First of all we have pitch, used most extensively for making smooth, clean, and pleasant footpaths, promenades, and even roadways. Some of the oily products which pass off are used to preserve the sleepers on our railways, and other materials used in building which it is desirable to preserve from decay. Another solid substance, paraffin, is also obtained, which is now extensively used as an illuminating agent, and, when mixed with oils, as a lubricator. It has also of late been employed with marked success by Dr. Stenhouse as a substitute for caoutchouc, for preventing the permeation of damp or wet through fabrics. In addition to these, more volatile products are obtained, which were first applied to dissolve caoutchouc and other materials of the same class, and which, in their turn, were applied to a number of useful purposes. The chemical composition of these volatile products, having been further studied, means were devised for obtaining, by chemical transformation, a series of colours, rivalling in beauty, in cheapness, and in facility of application any dyes which were previously known to the world. Lastly, from coal tar or from coals a most powerful antiseptic agent is obtained, the value of which has been lately demonstrated in the cases

of the cattle plague and the cholera. The properties of this substance have not yet been fully ascertained, but in course of time it will prove to be one of the most important yet discovered, owing to its powerful antiseptic properties, for we may consider most of the ailments and diseases of mankind as derived from the decomposition or decay of some of the tissues, and it therefore follows that in all diseases or decay whose source can be traced to the decomposition of organic matter, carbolic acid must undeniably be the most effective remedy.

It therefore follows that the most interesting branch of organic chemistry is comprised in the title of this course of lectures:—"The Synthesis and Production of Organic Substances by Artificial means."

The perfect knowledge which chemists have obtained by analysis of the relationship of composition which exists between organic substances, has enabled them of late years to produce artificially, or convert substances one into another, which they never could have succeeded in doing had they not had a clear insight into the composition and properties of substances under examination as compared with those they wished ultimately to reproduce.

It now devolves upon me to try to lay before you an outline of some of the methods which chemists have employed to ascertain the composition of an organic substance, and how they are able from that knowledge either to add certain elements to a substance so as to modify its composition and alter its properties, or to subtract certain elements and add instead of them certain others so as to produce new substances, which are identical with those which they want to re-produce or imitate. As it would be difficult for me in the course of an hour to lay before you the details of the system now employed by chemists to effect this end, I shall therefore try to give you an idea of that system generally by calling your attention to a new series of facts discovered by one of the most able of modern chemists, namely, the synthesis of organic substances, especially alluding to those which have reference to their reproduction by means of mineral elements; and before this lecture is over I hope you will be able to understand fully how that eminent chemist, M. Berthelot, has succeeded, by employing mineral matters, and by a series of successive chemical reactions, in producing substances which have hitherto been derived or are obtainable from the organic kingdom either by being extracted direct from their sources of production by a series of chemical manipulations, or which are the result of the destruction of organic substances under the influence of heat or decay.

The first example which I shall have the pleasure of calling your attention to is a gaseous compound called acetylene, or the richest carburetted hydrogen known, for it contains four atoms of carbon for two atoms of hydrogen. Although this product always exists, but in small proportions, in common coal gas, still M. Berthelot asserts—and no doubt with truth—that its presence increases materially the brilliancy of common coal gas, owing to the large proportion of carbon it contains, and which by floating in the flame radiates light and thereby increases its brilliancy. This substance is characterised by giving, with a solution of protochloride of copper dissolved in ammonia, a beautiful coppery precipitate, which is highly explosive. Acetylene, also, when mixed with chlorine, and the mixture is exposed to the action of light, or to any flame containing chemical rays, such as those produced by the combustion of magnesium or sulphuret of carbon, gives rise to violent explosions with the production of hydrochloric acid and a deposit of carbon. This fact I wish you to notice, as it will be, further on, a means of distinguishing this substance from another one, which is the chief illuminating agent of coal-gas, and called ethylene, or heavy carburetted hydrogen. This substance (acetylene) does not exist merely in coal gas. M. Berthelot has proved it to exist in a great number of instances, and to be a constant product of the slow combustion of most organic substances.

Further, this substance offers to us a peculiar interest, for it is the first ever produced by chemists by the direct union of carbon and hydrogen. Up to the time of this discovery, chemists were acquainted with a great number of carburetted hydrogens, either obtained naturally from the organic kingdom, such, for example, as otto of roses, the essences of lemon, bergamot, cloves, neroli, and the solid substances called caoutchouc, gutta-percha, as well as a great number of others obtained through the destructive distillation of organic matters, as well as coals, such as ethylene, amylene, caprolene, propylene, &c. M. Berthelot succeeded in obtaining acetylene (as I will show you at the end of this lecture) by passing through a glass globe a slow current of hydrogen gas, in which globe there were the two carbon points of an electrical battery in a state of incandescence, producing what is usually called the electrical light. Under this intense heat and electrical current, the hydrogen introduced by him combined with the carbon of the points and produced acetylene, which he collected by passing it through an ammoniacal solution of proto-chloride of copper, getting a coppery precipitate, or acetylide of copper, from which he easily isolated acetylene, thus proving to the chemical world the possibility of the artificial production of a carburetted hydrogen.

This discovery, which astonished the scientific world, was soon followed up by a series of most interesting facts. M. Berthelot having placed in a small flask, to which was attached a tube allowing the exit of any gas which might escape, some acetylide of copper, together with zinc and ammonia, and on heat being applied a chemical reaction ensued, by which two atoms of hydrogen were added to acetylene, converting it into ethylene or heavy curburetted hydrogen, also called olefiant gas,—a name which it derives from the fact that, about thirty years ago, some Dutch chemists having mixed this gas with chlorine and exposed the whole to diffused light, an oily fluid was produced called Dutch liquor, and the fluid having, as just stated, an oily appearance, gave rise to the gas being called olefiant. This gas is exceedingly interesting, owing to its being the chief illuminating element in common coal gas, and is characterised by burning with a bright flame, with no deposit of carbon, like acetylene, and when mixed with one equivalent of chlorine, and the mixture left to itself for some time, the chlorine unites with the olefiant gas, producing the oily fluid above referred to, called Dutch liquor; but when mixed with two volumes of chlorine, and a lighted taper brought in contact with them, hydrochloric acid is formed, and carbon is deposited; further, it is absorbed slowly by sulphuric acid, whose property, we shall see presently, M. Berthelot has most judiciously availed himself of to convert it into an organic substance. The olefiant gas, though existing in large quantities in common coal gas, cannot be isolated, owing to the numerous compounds with which it is mixed. Therefore it is necessary to adopt some chemical reaction to produce it in a pure state when it is desired to investigate its properties. To attain this end, one part of alcohol is mixed with three parts of vitriol or sulphuric acid, and on being applied each chemical equivalent of alcohol loses two equivalents of water; the remaining element of the alcohol, being olefiant gas, is liberated and can be examined. What gives interest to this chemical reaction is, that whilst you thus separate, under the influence of heat, alcohol into olefiant gas and water, you will, if we follow M. Berthelot's process, namely, of placing at the bottom a large glass globe, a small quantity of concentrated sulphuric acid, and filling the remaining portion of the globe with olefiant gas, keeping the same in a constant state of agitation, you will, after having imparted to the vessel some [illegible] or 50,000 rotatory motions, find that the olefiant gas has been absorbed by the vitriol; that it will have fixed two

equivalents of water, and that it will have thus converted the olefiant gas into alcohol, which can be isolated by subsequent chemical manipulations. Therefore, from carbon and hydrogen, you will notice that we first produced acetylene; this substance we have converted into olefiant gas, which in its turn has been transformed into alcohol, which alcohol you can easily convert into ordinary ether, as I shall explain to you in my next lecture, or into acetic ether, spirit of nitre, or nitric ether, &c.; or you can also, by oxidising, convert it into a substance, which I shall also refer to, called aldehyde. To convert alcohol into ether, all you have to do is to remove from alcohol one chemical proportion of water, and the elements which remain, namely, one of olefiant gas and one of water, constitute ether.

We can still further pursue these interesting transformations. For if you add four proportions of oxygen to olefiant gas, or if you act upon alcohol, by means of platinum black, or, as I have lately discovered, by means of charcoal in presence of an excess of oxygen, you will convert alcohol into acetic acid, or vinegar. It therefore follows that, from carbon and hydrogen, mineral elements, a great number of organic substances can be produced. In fact, from acetylene the following series of compounds have been obtained:—

Acetylene can be transformed into			($C^4 H^2$)
Ethylene into	,,	,,	($C^4 H^4$)
Aldehyde into	,,	,,	($C^4 H^4 O^2$)
Acetic acid into	,,	,,	($C^4 H^4 O^4$)
Glycollic acid into	,,	,,	($C^4 H^4 O^6$)
Oxyglycollic acid into		,,	($C^4 H^4 O^8$)
Oxalic	,,	,,	($C^4 H^2 O^8$)

Allow me to call your attention to another series of facts, by which M. Berthelot has also demonstrated the possibility of producing organic substances from mineral elements. The starting-point of this series is a gas well known by name to all my hearers. It is called "fire-damp," owing to the fact that it exists more or less in all coal-pits, and that when it is liberated in large quantities, and gets mixed with the atmosphere, it produces a most explosive mixture, the result of which is the destruction of thousands of lives in this country. This gas also bears the name of marsh-gas, from the circumstance that it is a constant product of the slow decay of organic matter. In fact, some twenty or thirty years ago, when a lecturer wished to illustrate the properties of this gas, called also light carburetted hydrogen, as compared with olefiant gas, which is called heavy carburetted hydrogen, his assistant had to proceed, as I have done myself, into marshy districts, and, by stirring up the mud, collect the few bubbles of gas that escaped from the swamp. This operation—to collect a gas mixed with impurities—which was far from agreeable when it had to be done in January or December, has been obviated through the progress of chemistry. Some twenty years since, Dumas found that when he heated in a retort a mixture of dry acetate of soda with baryta, a gas was generated which was marsh gas, resulting from the following reaction, the acetic acid of the acetate of soda having separated itself into carbonic acid, fixed by the baryta, the remaining element was marsh gas. But Berthelot has gone a step forward, and he has succeeded in producing fire-damp, or marsh-gas, direct from mineral elements. He has effected this interesting discovery by passing over some heated copper foils, placed in an earthenware tube, a mixture of two substances, namely, sulphuretted hydrogen and sulphuret of carbon. Under the influence of heat, the sulphur of the sulphuretted hydrogen and of the sulphuret of carbon unite with the copper, whilst the hydrogen of the sulphuretted hydrogen and the carbon of the sulphuret of carbon combine together to produce marsh gas.

This triumph of modern chemistry is most important, for if to marsh gas you proceed to add two proportions of water, it will be converted into methylated spirit, or wood naphtha, a substance now extensively mixed with alcohol to manufacture the product called "methylated spirit," so extensively employed in England at the present time in arts and manufactures, and which has been the means of removing the duty usually imposed by Government upon all alcoholic liquors capable of being used as a beverage, and enables English manufacturers to produce a variety of varnishes, &c., and to enter fairly into the field of competition with those countries in which alcohol may be considered a cheap article.

We may proceed a step further still, and convert this alcohol of wood, as it is often called, into an acid by a similar process as we succeeded just now in converting the alcohol of wine into acetic acid. Thus, if in a flat vessel is placed a small quantity of wood naphtha, and above it is suspended a watch-glass containing platinum black, or purified charcoal, and the whole confined in a bell jar, gradually the vapours arising from the wood naphtha come in contact with the platinum black and are converted into an acid called formic acid—an acid which can be extracted from the well-known insect the ant, or *Formica*. Therefore from carbon and hydrogen M. Berthelot has produced not only wood naphtha but formic acid, the product of an animal. Formic acid has become, like many other organic substances, a curiosity one day, a commercial product the next. It is now manufactured artificially in large quantities, owing to its successful application in the production of those beautiful tar colours, especially blue, to which we have already referred in this lecture. But the application of formic acid, I think, will not be limited; it will extend widely with time, not only because it reduces with great facility metallic salts, especially those of silver—and thus will, no doubt, become in time the means of silvering glass, instead of having to employ the present costly method.

Whilst dwelling on formic acid, let me call attention to a direct artificial mode of production of that substance, also from mineral elements, by a most skilful process devised by M. Berthelot. All persons must have noticed, on a winter's evening, on sitting before the hearth of a good fire, which has yielded up its gaseous matters under the form of flame and has left a red glowing mass, a fugitive blue flame, which has received the name of oxide of carbon—gas which is in fact always produced when oxygen is brought in contact with an excess of carbonaceous mass in a state of incandescence. This blue-burning gas, or oxide of carbon, which is highly poisonous, is the gas chosen by M. Berthelot to produce formic acid. To attain this end he pours into the bottom of a large glass vessel a strong solution of caustic lye of soda or potash, and fills up the vessel with oxide of carbon. After giving a rotatory motion to the glass vessel, the oxide of carbon is absorbed by the potash, and each two chemical proportions of oxide of carbon, in fixing one chemical proportion of water, is converted into formic acid, which unites with the potash to produce formiate of potash or soda. Besides these two interesting discoveries of the production of organic substances direct from mineral elements, M. Berthelot and several other chemists have produced organic acids from other hydro-carbons derived either from destructive distillation of coal or other organic substances. Thus the acid existing in valerian root has been generated from a hydro-carbon existing in petroleum, called amylene. Propylere has been converted into proprianic acid, naphthaline into benzoic acid, &c. Further, hydro-carbons which are found existing in the products of the distillation of coal, as well as those existing in petroleum, can

be produced artificially by chemical manipulation, and these hydro-carbons are in their turn the centre of a great number of chemical substances, which chemists have succeeded in producing, either adding elements to them, or substituting certain quantities of their hydrogen by other elements, thus giving rise to a new series of products, and thereby a great variety of organic substances.

It will, therefore, be easy to understand how important it is for chemists to be able to produce artificially from one carburetted hydrogen another carburetted hydrogen, and this M. Berthelot has been most successful in accomplishing. By heating, at a high temperature, light carburetted hydrogen he has succeeded in producing artificially benzine, a substance now so extensively employed, as I have told you in some of my former lectures, in producing most of the tar colours now used in trade. He has also obtained napthaline by the same means; and you will perceive by the following tables that it is simply necessary to add to a carburetted hydrogen, say equivalent proportions of carbon and hydrogen, to convert it by successive addition into a series of hydro-carbons, susceptible in their turn, by means of oxidisation and other chemical action, of being converted into acids and other products:—

Ethylene	$C^4 H^4$
Propylene	$C^6 H^6$
Butylene	$C^8 H^8$
Amylene	$C^{10} H^{10}$
Caproylene	$C^{12} H^{12}$
Œnonthylene	$C^{14} H^{14}$
Caprylene	$C^{16} H^{16}$
Ethnlene	$C^{32} H^{32}$
Cerylene	$C^{32} H^{32}$
Melissene	$C^{60} H^{60}$
Or,	
Marsh gas or formyl	$C^2 H^4$
Hydrate of acetyl	$C^4 H^6$
„ propnonyl	$C^6 H^8$
„ butyl	$C^8 H^{10}$
„ ralyl	$C^{10} H^{12}$

That eminent chemist, Dr. Hoffman, has succeeded in producing of late years a great variety of organic substances, by substituting for the hydrogen which enters into the composition of ammonia or hartshorn (composed of three atoms of hydrogen and one atom of nitrogen), some of the above carburetted hydrogens, thus giving rise to a most interesting series of products, many of which in time will doubtless become extensively employed in arts and manufactures. I cannot leave this part of my subject without mentioning the names of Dr. Frankland, Professor Williamson, Messrs. Duppa, Wanklyn, Perkins, and Foster, among our English chemists, who have much contributed to the progress of organic chemistry by their successful researches in reproducing artificially organic substances, on some of which I shall have the pleasure of dwelling fully during this course of lectures. There are other discoveries not less interesting, but which are in themselves too abstruse, and which involve too many scientific data to justify me in bringing them before you in addresses intended for a general audience, and not especially for a particular branch of professional students.

The lecture was concluded by illustrations with apparatus, giving an outline of the methods followed by chemists to determine the elementary composition of an organic substance. Without entering here into all the details of manipulation necessary, and a description of the apparatus used for ascertaining these compositions, it may be stated that the object of these operations was to determine the exact quantity of carbon (charcoal), and the exact proportion of hydrogen gas which exist in 100 parts of an organic substance. This being determined, the figure necessary to reconstitute the 100 parts of the organic substance employed is represented by oxygen, and it is easy to calculate, by employing chemical equivalents, what is the formula which that organic substance should have. To determine the amount of carbon and hydrogen in the substance, it is placed in a tube, and after being carried to a red heat it is subjected to the action of oxygen, either employed as a gas or in contact with a substance such as oxide of copper or chromate of lead, which yield oxygen with facility. The result is that the carbon is converted into carbonic acid, which is absorbed by alkali, and its amount accurately determined, and the hydrogen of the organic substances is converted into water, which is condensed by means of oil of vitriol, and thus its proportions are accurately ascertained. With these data it is easy to determine the number of atoms of hydrogen, carbon, or oxygen which exist in organic substances. As to organic substances which contain nitrogen, the porportion of this gas in 100 parts of the substance submitted to elementary analysis is determined either by collecting it as a gas, and from its volume calculating the amount in the substance, or it is converted into ammonia, which, in its turn, is absorbed by sulphuric acid, and its amount also accurately ascertained. By these methods the amount of nitrogen in the organic substance is known.

NEW PRIZES AT THE PARIS EXHIBITION.

A correspondent addresses the *Times*, asking for an explanation of these prizes, as follows:—

Sir,—Some new and startling prizes of a munificent kind are offered to the world at large at the Paris Exhibition of next year. Besides one *grand prix* of four thousand pounds sterling, there are ten lesser prizes of four hundred pounds each. They are to be given, using the words of the proclamation of the Imperial Commission, "to persons, establishments, or localities, which by a special organization or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen." Can you help me and others interested to some specimens of the kind of candidates most suitable for these prizes? I confess myself rather puzzled. Would Saltaire, near Bradford, that new city, with its complete sanitary arrangements, its schools, chapels, clubs, halls, and perfect factory organization, be a proper recipient? or the London and North Western Railway, with its staff of old servants, churches, schools, workshops, and army of labourers? The co-operative store at Rochdale would seem eligible, but how can it be said to have promoted the intellectual well-being of the workmen? Could the Rev. F. D. Maurice, Working Men's College, be a candidate? Would a well worked parish be accepted? What is meant by a special institution? A hospital, club, museum, or what? Pray enlighten candidates if you can; if not, try and persuade your contemporary, the *Moniteur*, to do so.—I am, your obedient servant, A Puzzled Reader.

20th Sept., 1866.

[It certainly is not clear what is to be the guiding idea,—whether harmony among workmen co-operating, or this combined with morality and intellect. Many cases might be instanced where the object of the Institution has been the intellectual improvement of workmen which has induced morality and harmony. Members are invited to discuss the subject in the *Journal*. Candidates for the prizes must send in their claims to H.M. Commissioners before 31st October next.—Ed. *J.S.A.*]

EXTENSION OF TEA CULTIVATION.

The following article is taken from the *Produce Markets' Review*:—"The Darwinian theory, in its attempt to explain some of Nature's mysterious laws, refers their solution to the natural selection of species, and represents the various families of animal creation as engaged in one life-long—we might almost say, perpetual

—struggle for existence. The legend of Ormuzd and Ahriman, in Persian mythology, and of Vishnu, the creator, and Seeva the destroyer, in the mythology of the Hindoos, is typical, no doubt, of the two great agencies of nature, the production of life and its destruction. But it is not only here that we find proofs of this innate antagonism; we see evidence of its existence in the vegetable kingdom. With less of poetical sentiment, but more practical directness, we recognise this struggle as one between production and consumption. To determine in what way, and to what extent, these two important elements act and re-act upon each other is a question affecting perhaps more than any other the welfare of the human race; and a consideration of some of the points bearing upon the question, though in the present instance having a more immediate reference to tea, may be regarded as not out of place in a journal professing to deal exclusively with articles of produce. At first sight it would appear as if no reliable relation between consumption and production could be established, from which conclusions might be deduced; for whilst the power of consumption might be presumed to be almost limitless, bounded in fact only by the extent to which population itself may be increased, it is as confidently believed that production could only be carried on under narrower limits, restricted by considerations of temperature, soil, and human labour. It is, however, easy to check consumption by prices, and statesmen, when they thought that if an impost upon any article of prime necessity were doubled, the revenue accruing from this impost must also be doubled, were arguing upon a fallacy. The possibility of a decrease in the consuming power was tacitly disregarded by them, and it is only within a comparatively recent period that the magnitude of the error underlying the assumption has been comprehended to its full extent, and the superior productiveness of low duties admitted as a fact without reserve or qualification. And perhaps even at the present day these antiquated and fallacious maxims might hold good had it not been for the aid brought to bear upon the subject by statistical science, a science without which no study can be deemed profitable, no theory complete. Whilst opinions so erroneous prevailed on the subject of consumption, it was not likely that the views generally held on production should be more enlightened; and we find accordingly the most timid, and perhaps to some minds even alarmist, views on the subject of Nature's productive powers. Of such a character was the opinion recently promulgated, as to the probable scarcity of coal within our island; and such too are the views put forward from time to time with regard to our future supply of tea, in all sincerity doubtless, but with a somewhat partial and exaggerated estimate of things as seen from one point of view exclusively. That increasing consumption brings with it an increasing production is surely as much a familiar fact as that an extended cultivation, by introducing competition, and so lowering prices, will encourage increased consumption. But to assert that consumption is overtaking production, or, what is the same thing, that production will fall short of the demand made upon it, is very much like saying that the hinder wheels of a carriage must before long overtake the front wheels. The fact is, that these two agencies—consumption and production—are so inextricably interwoven in their action upon each other that it is impossible to estimate with exactness the precise value of the one without considering it in its relation to the other. As contrasted with animals of a lower organism, man is distinguished by his ability to live and thrive under the most opposite conditions of climate and temperature, from the poles to the equator; and this universality of existence is shared to almost the same extent by those plants and herbs which are more immediately necessary to his subsistence, such as corn, the potato, &c. Before long we may even be in a position to include tea in this list, as its cultivation is now being attempted in all quarters of the globe, in Asia, Australia, Africa, and America, and it has also been attempted in Southern Europe, with results which gave strong hope of its profitable introduction into Spain and Italy. We propose to show that China is not the only place from which we can obtain our tea supplies. We do not mean to say that tea could be immediately produced in marketable quantities wherever the climate is suitable; but that, in the course of time, if prices were sufficiently tempting, we might become independent of China and Japan. Putting aside India, which could supply not only England, but the whole world with tea, we turn to other parts of the world where, as yet, tea cultivation is only an experiment. "The important experiment of testing the climate and soil of South Australia, as regards their suitability for the China tea plant," says the *Melbourne Register*, "is about to be made on a somewhat extensive scale. The Government have agreed to pay Mr. Sterndale, who recently brought a quantity of tea seed to the colony, the sum of £50 for one hundredweight of the seed, and they have instructed Dr. Schomburgh, superintendent of the Botanic Garden, to sow and distribute it, with the view of fairly testing its adaptability to this country. Accordingly, it has been determined by the governors of the Botanic Garden that one-half of the quantity shall be sown in the grounds of that establishment, and that the other half shall be distributed in various parts of the colony."

In South Africa, the experiment of tea cultivation seems to have been attended with the most complete success. "In another column," says the *Natal Mercury* of July 3rd, 1866, "will be found an advertisement offering for sale the first tea trees imported into the colony. That soil or climate is no bar to the successful production of tea in Natal these trees will abundantly prove. They were imported about ten years ago, and were then small plants, bearing from ten to fifteen leaves each, and since then have grown like native bushes, until they are now thick shrubs from six to eight feet high, and as much through. A small sample of tea made from these plants, with unsuitable appliances, was sent with the Natal collection to the London Exhibition in 1862, and obtained an award of commendation from the jurors. We should be glad to see this enterprise taken up with energy, now that an opening presents itself, and the article of tea added to the staple products of the colony."

And fifteen years ago an American author, Francis Bonynge, descanting on the future wealth of the United States, and the possibility of a decline in the cotton trade, proposed the substitution of tea, coffee, or indigo, in the place of the cotton plant. After an elaborate comparison between China and America, considered with respect to climate, soil, and the price of labour, Mr. Bonynge comes to the conclusion, in which we fully concur, that in the event of any considerable reduction taking place in the price of tea, Europe, or we might say England, could consume five or six hundred millions lbs. of tea as readily as the one hundred millions, the quantity which represents our annual consumption. Mr. Bonynge goes on to prove that its production in America could profitably carried on at as low a sum as 2¾ to 3¾ cents per lb.—an opinion which we are not prepared to endorse so unhesitatingly. It is but fair to Mr. Bonynge to admit that his remarks upon the suitability of America for the cultivation of the tea plant are curiously corroborated by one of the most eminent of modern botanists, Professor de Candolle, from whose address, delivered this year at the Horticultural Exhibition at Kensington, we quote the following remarks:—

"Botanical geography shows in the clearest manner the analogy between the vegetation and climate of certain regions; and, just as a celebrated geologist was able to say, beforehand, there was gold in such a part of New Holland, and gold was found there, so could the botanist say with equal certainty that the olive tree and the cork oak would succeed in Australia;

that the eastern and temperate region of the United States was favourable to the growth of Chinese plants, more particularly to that of tea; and that that part of America included between San Francisco and the Oregon territory would, one day, supply wines as varied and as excellent as those European ones produced between Portugal and the Rhine. It is a singular fact that the two principal beverages of the civilised world, wine and tea, which produce similar stimulating effects, and which to a certain extent are the substitutes one for the other in different countries, present also in the mode of cultivating them the most marked resemblances and differences. The vine and the tea plant succeed best on stony, barren hill-sides. The two shrubs require a temperature climate, but the vine requires heat, and no rain during summer, whilst the tea-plant requires rain, and but little summer heat; the result of which is that these two species are almost geographically incompatible. Vine-growing countries will never produce tea, and *vice versâ*." The experiment which Mr. Bonynge so warmly recommended had previously been tried with the most encouraging prospects of success by Dr. Junius Smith, in the year 1849, in South Carolina. Upwards of 500 plants of from five to seven years' growth were imported from China and India; and it is interesting to know that the general characteristics of the plant remain unchanged by the new climate and soil, and that the "leaf puts out at the same period of the year that it does in China." (Simmonds' *Commercial Products*, p. 96). Dr. Smith estimated that he could produce tea in America at as low a price as 5d. per lb., whilst the average cost in China at the ship's side is at least 10d. per lb. This excessive cost, that is, apparently excessive, when contrasted with Dr. Smith's moderate estimate, arises almost wholly from the expensive nature of the means of transport, and the want of proper machinery. "In America," says Simmonds, the authority just quoted, "the beating and rolling of the leaves, one-half of the labour, could be done by the simplest machinery, whilst the fuel could be economised by means of flues." It has been suggested, too, with great plausibility, that it might be cultivated with success in California, where there are already so many Chinese on the spot, whose labour and experience would be thus utilized, when the gold hunting mania had subsided. "The climate, soil, and surface of California," says Simmonds, "exactly answer the requirements for the growth of this plant. The time may yet come when the vast ranges of hills that traverse this state shall present terraces of tea gardens, cultivated by the laborious Chinese, and adding millions to the value of its products." We may add, that we heard some time since that tea was successfully grown in Florida. It also appears that the cultivation has been carried on in Brazil since the beginning of the century, and that the industry still exists, though on a small scale. The Dutch seem to have been the first to break in upon the Chinese monopoly of tea cultivation, by introducing the plant into Java in the year 1828; and in the year 1848 as much as 1,000,000 lbs. was shipped from that island. The tea plant grows also in Cochin China, Tonquin, and some of the mountainous parts of Burmah, but the quality is generally considered inferior.

The Indian crop may now be roughly reckoned at 4,000,000 lbs., but official papers show that the tea land on the slopes of the Himalayas alone is capable of producing 600,000,000 lbs. of tea annually. By way of an appropriate pendent to these remarks we turn to Mr. Henry Waterfield's able report on the moral and material progress of India during the year 1864-5, and find the following remarks on the subject of tea cultivation in India:—"Considerable difficulty was experienced in obtaining information as to the progress of tea cultivation in Assam, owing to the reticence of the planters. According to the most accurate returns which could be procured, the extent of land under cultivation increased by 12,838 acres, and the out-turn of tea by 188,217 lbs. The numbers of proprietors was three hundred and sixty-six, of whom one hundred and forty-nine were natives, but several of the latter were merely owners of grants, with nominal clearances on them. The estimated produce in 1865, if realized, will give, at the price obtained in England, receipts to the value of £300,000. The area taken up for tea planting in Assam is 516,475 acres, of which about a twelfth has been brought under cultivation. There seems ground for apprehension that, unless great activity is shown in importing labourers, some of the lands already cleared will run again into jungle, as the available number of workmen in the province does not give one person for each acre that is cultivated. There is, however, no indication of a decrease in the popularity of tea planting; and though not perhaps as profitable as it was to the first owners who prepared the estates, and sold them at an enormous advance on their outlay, it promised to afford a safe and reasonable profit to all those who have not paid an excessive price for their gardens.

"In Sylhet there was a very slight increase in the area cultivated, but the out-turn of tea exceeded that of the previous year by nearly 25,000 lbs. The soil of Chota Nagpore is considered to be as well suited for tea as that of Assam, but the climate is rather against a favourable development of the plant, though the results already obtained are sufficient to warrant a fair hope of success. The cultivation of coffee was also commenced in that division. The quality of the tea raised by the Rhamghur Company in the Hazareebagh district is pronounced to be excellent. The number of labourers embarked for the tea plantations in Assam, Cachar, and Sylhet, was 28,282. The Act which was passed by the Bengal Council to regulate their contracts has been mentioned in another part of this report. Great care and consideration are now shown to the coolies by contractors; and, from the few complaints which have been received, it is believed that they are well treated by the recruiters also.

"The yield of tea at the government plantations in the North-Western Provinces was 54,527 lbs., much of which went to the Umritsur market, or was exported to Affghanistan and Cashmere. The cultivation of tea has been commenced in Oude by some European gentlemen, who have purchased waste lands, and laid out large sums of money in their reclamation. There is hardly any available waste land suitable for tea in the Muree hills, and the only way by which its cultivation in that part of the Punjaub can be secured is by inducing the peasantry to undertake it, for which purpose many thousands of plants were distributed from the government plantations to the adjacent villages. The cultivation in the Kangra valley being now placed on a sound basis, the government has determined to withdraw from the undertaking, and the plantations at Holta will be sold by auction. Upwards of seventy tons of seeds, and 1,769,033 seedlings, were distributed gratis to planters during the year. In the Madras hills several acres of ground have been planted with the Chinese and Assam varieties of tea, with the view of supplying seed to planters." In this last statement Mr. Waterfield seems hardly to have realized the extent to which tea cultivation is being tried in Southern India. The omission from the report of Ceylon, where tea is also being tried with fair hopes of success, is probably due to the fact that Ceylon is technically a crown colony, and is thus excluded from an Indian report, as India is under a different branch of the Government. When these various facts are taken into consideration it will be seen that there is little chance of production being overtaken by consumption, and that the question of the introduction of tea cultivation over the greater part of the semi-temperate portion of the globe is simply one of price and of time.

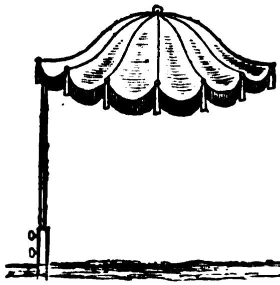
It would appear, in short, as if the tea-plant, like the potato, on account of its being necessary to man as a

article of food, were capable of being cultivated almost anywhere. Little fear, then, need be felt on the score of its possible scarcity in one particular country. Indeed, at present, the quantity that we derive from sources other than China itself amounts to no less than 14,000,000 lbs., about 12½ per cent., or one-eighth of the total exports from China. When it is remembered that the sources out of China, from which these supplies are drawn are entirely new, it will, we think, be conceded that our arguments on the subject of tea extension are not chimerical, but founded on fact.

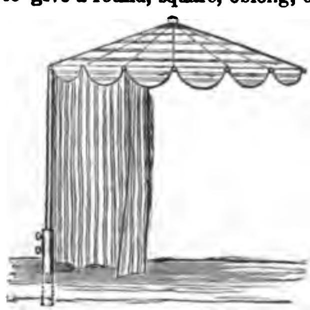
SUN SHADE FOR GARDEN SEATS.

The following is a description of "The sun shade for garden seats," for which a prize of £3, given by the Society of Arts, was awarded to Mr. T. L. Scowan, at the International Horticultural Congress* :—

This canopy, or sun shade, for garden seats, is constructed rather upon the principal of the fin of a fish, or



a pair of wings, horizontally expanded, with the two front edges brought together. This horizontal action enables the maker to give a round, square, oblong, or any other



shape required, and to place the stem at any part from centre to edge, the latter being a very great advantage where required, as it leaves the whole of the centre of

the canopy unobstructed. This canopy, with the addition of a curtain, forms a most complete sun shade, which can be erected or taken down in one minute.

In erecting the canopy a tubular spike is first driven into the ground, and the stem inserted therein, which, acting telescopically, can be raised or lowered to height required. The canopy is then placed on the stem and opened. The facility with which this canopy can be expanded, or collapsed and taken down, offers the opportunity of keeping it clean and free from insects.

These canopies are also extensively used, made in suitable material with proper fittings, upon open carriages, such as wagonettes, park phaetons, perambulators, &c.

* See *Journal*, p. 577, Class 231 D.

Fine Arts.

BURLINGTON HOUSE.—The London University and the Royal Academy lose no time in taking advantage of the last decision of the House of Commons. Already the space of ground at the back of Burlington-house is apportioned between the two claimants, and the London University has commenced active operations. Trees are felled, and the ground is levelled for the foundations. The moiety of Burlington-gardens which falls to the lot of the University will give a spacious, and yet fortunately, as to traffic, a quiet and secluded frontage towards Cork-street and Burlington-street. Mr. Pennethorne's designs for the building, with the exception of some final details, are now prepared. He had, in the first instance, presented to Lord John Manners a classic façade, but, at the request of the First Commissioner of Public Works, the design ultimately adopted was made. The style, which finds affinity to that of buildings in the North of Italy, is transitional, not wholly divorced from the classic on the one hand, and yet holding still closer affinity to Gothic forms. The elevation consists of a centre and two wings; in the latter are two spacious lecture-theatres; the examination-rooms, &c., occupy the main body; the entire ground plan covers an area of about 220 feet by 150 feet. The treatment, though allied to Italian Gothic, is yet independent and individual: no one model in Venice or Lombardy has been implicitly followed: on the contrary, the whole design has been adapted to the exigencies of climate, demands of utility, and the resources of local materials. For the marble architecture of Italy will be substituted a stone architecture, which may be more in keeping with immediate surroundings, and the cheaper and ruder material will be so employed as to secure polychromatic display. The adopted Gothic, too, admits of varied sky outline: a steep roof, and a couple of lofty campanile will present a bold profile. The parliamentary estimate is £65,000, of which £20,000 was voted last session as a first instalment. The remaining moiety of the gardens, that adjoining Burlington-house, has not yet undergone any marked change under the hands of its present owners, the Royal Academicians. The volunteer drill shed, as also the more venerable trees, still stand undisturbed tenants of the soil. It is understood, however, that the Academy will not be slow to avail itself of the advantages offered by the present Government. One of the body, Mr. Sidney Smirke, is entrusted with the making of plans for the new galleries, in which, in the course of two years, it is hoped the Academy Exhibition may be held. To this portion of the entire scheme, which vitally affects the future of the Academy, we shall revert when the plans are finally matured. Under present arrangements, the façade of Burlington-house, which the Institute of Architects and their President, Mr. Beresford Hope, made efforts to save, will remain intact. The effective Doric or Palladian colonnade, however, that rounds off the area on the side next Piccadilly, and which some deem the best part of the architectural composition of the celebrated amateur, the Earl of Burlington, appears still in danger. It will doubtless be necessary to widen the present entrance from Piccadilly, which, though just sufficient to admit numerous carriages on the receptions of the President of the Royal Society, will not be spacious enough for the shilling visitors to the Academy Exhibition. The

inspection of the entire ground gives reason to hope that the present colonnades, and any further projected buildings, may be so thrown back as to gain the needed width of entrance and at the same time preserve the symmetry of the existing architectural composition. These several works are committed to the divided care of Mr. Pennethorne, Mr. Sidney Smirke, and Messrs. Banks and Barry. It will be the duty of the Commissioner of Works to see that the several designs, new and old, shall clash together as little as possible.

Manufactures.

Portuguese Alcohol.—A considerable quantity of spirits, used in the preparation of inferior wines, is manufactured in Portugal from figs, which are largely grown in the provinces of Algeria and Alentigo. Spirit of an inferior quality, used only in the preparation of liqueurs, is also manufactured in large quantities from a small fruit called medronhos (the berry of the arbutus), which is extensively grown in the country.

Cotton Manufactures.—The total declared value of the cotton manufactures exported last year, exclusive of yarn, was close upon 47 millions sterling, being one and a quarter million in excess of 1864, and nearly seven and a half millions over that of 1863. The exports of 1865 were thus made up:—

Cotton yarn value	£10,351,049
Piece goods	44,860,239
Lace and patent net	462,263
Cotton hosiery and small wares	827,856
Thread	753,438
Total	57,254,845

This year shows even still greater progress, the cotton manufactures shipped in the first six months being of the value of £30,418,404, and the yarn £6,680,747.

Commerce.

Railways and Communication in Russia.—Railways have been for some years the object of special attention to the Russian government. The surveys of projected lines, as well as the works of those in execution, are receiving at the present time a fresh impulse. St. Petersburg, Moscow, and Warsaw are already in communication with each other; and Eastern Prussia and Berlin may be reached by Gumbinnen and Thorn. More towards the south the Russian lines join those of Cracovia, leading to the two Prussian Silesias; and before long the southern line, which at present is opened from Odessa to Balta, will communicate with Bessarabia, a province bordering on the Roumanian principalities, and communicating with the Lemberg railway in Galicia. Another central line, running from north to south, is intended to unite the capital, Moscow, Ozel, Koursk, Kharkov, Nicolaieff, Sebastopol, and Taganrog, and to put the Gulf of Finland into communication with the Crimea. The southern part of this line is intended in the east to fulfil the same purpose as that of the Odessa-Balta in the west, viz., that of bringing to the two ports of exportation, Taganrog and Odessa, the wheat of Ukraine, of Pultava, of Ekaterinoslav, of Kherson, and of Podolia. A branch from the Balta line would no doubt run north-east towards the central part of the Ural. In a few weeks the trunk lying between Moscow and Serpoukhoff will be opened for traffic, and as far as Koursk next year. Supposing she could not, without solution of continuity, carry her products from the Baltic to the Black Sea, she has railways that lead or will lead within a little, to the frontiers of all her neighbours from the Pruth to Niemen. Other interior and transversal lines, such as those of Riazan, of Nijni Novogorod, are of great utility, but none more worthy of interest than the two following, intended to form a double communication between the Caspian and the Black Seas. The first of these lines, which is but twenty leagues in length, is in full work. It begins at Tzaritzin, an important town situated on the right bank of the Volga, which falls into the Caspian, and finishes at Kalatcheff, a town on the left bank of the Don, which falls into the Sea of Azof. The second of these lines is due to the energy of the Grand Duke Michael, Governor-General of the Caucasus. A line of railway is likewise intended to unite the port of Poti on the Black Sea with that of Bakon, on the Caspian Sea, passing by Koutaïs and Tiflis; the line follows principally the valleys of the Rion and the Kour. For the last two years six thousand soldiers have been employed under the direction of Mr. Bailly, an English engineer. The port of Poti is now the site of important works, which will make it the principal port of the Black Sea in these parts. Besides this, the organisation of a direct service of steamboats with Constantinople, and the establishment of a good carriage road between Tiflis and Tauris is in contemplation. Merchandise from Persia and Central Asia will probably follow the Russian lines, and it may be foreseen that the Transcaucasian line will almost completely absorb in these parts the traffic between Europe and Asia.

Preservation of Fruit by Means of Ice.—An American merchant, who has undertaken the importation of Boston ice to the Cape, proposes the importation of fresh grapes from that colony to Europe, preserved by means of ice. A trial of this mode of preservation has already been made at Cape Town, with very good results. A certain quantity of grapes and apricots were surrounded with ice, and were perfectly preserved for six weeks. If the trial answers, a great success seems to be reserved for this undertaking. For instance, at the Cape the seasons are quite opposite to those of England and France, consequently the grape which ripens at the Cape towards the end of January, would arrive in England or France about thirty days after, that is to say during the winter. The Cape grapes are savoury, sweet, and large, they would therefore be much relished in Europe. They have, besides, the great advantage of being cheap. The exporter would be able to procure them, in buying on a large scale from the vineyards, at the price of one penny the pound, and, in delivering them in London at a shilling, would clear a very satisfactory profit. Admitting their being retailed in London at 1s. 3d., and at Paris at 1s. 8d. or 2s., it will be seen that this is a very moderate price for obtaining fresh and excellent grapes. This enterprise in other quarters, thanks to the American ice trade, which tends to expand more and more, might start the idea of similar industries in all parts of the world, thus permitting Northern Europe, and especially England and France, to receive and taste all the delicious fruits with which tropical countries abound.

Railway Enterprise in Italy.—In Italy there will be shortly working 5,235 kilometres, or about 3,271 English miles, of railway. Besides the completion of the Venetian lines, which will reach in a few days as far as the borders of Illyria, and 302 kilometres recently finished in the valley of the Tiber and the Arus, that is to say, Ancona, Orte, and Montevarchi-Torricella, within two months there will be opened to the public 317 kilometres of new line, namely, those of Pavia and Cremona, Brescia, Messina, and Catania, the completion of the Aretuna and Ferrara and Rovigo, which includes the temporary bridge over the Po. Within a month Florence will be directly united by railway on the one side with Rome and Naples, and on the other with Venetia and the Frioul; the working of the Italian railways will then begin to acquire a systematic character. They will have for basis two great lines without interruption; the one, 1,080 kilometres in

extent, will traverse the peninsula from Udino to Naples by way of Padua, Ferrara, Podetta, Arezzo, Foligno, and Rome, and will cross at the Bologna station the other line, 1,200 kilometres in length, and which already unites Susa with Lecce, by way of Turin, Alexandria, Placenza, Modena, Rimini, Ancona, Bari, and Brindisi. At the same period it is expected that an important modification in the railway tariff will be adopted. The subject is already under consideration, and a long report has been drawn up.

CAOUTCHOUC AND GUTTA PERCHA.—The imports of india-rubber have kept pretty steady in the last few years. In 1863, 65,649 cwts. were imported; in 1864 and 1865, about 71,000 cwts.; and in the past six months of this year 30,000 cwts. have been received. Of gutta percha the imports are less steady, amounting to 21,655 cwts. in 1863; 35,646 in 1864; 29,077 in 1865; and only 8,019 cwts. in the first six months of 1866.

BULLION.—In 1863 we imported gold of the value of a little over 19 millions; in 1864, nearly 17 millions; in 1865, only 14½ millions; and in the first six months this year nearly 12½ millions. Against these the exports were—1863, 15¼ millions; 1864, 13¼; 1865, 8½; 1866, first six months, 7½ millions. Of silver, in 1863, we imported nearly 11 millions; in 1864, about the same; in 1865, under seven millions; and in the first six months of this year, four millions. The shipments of silver were, in 1863, 11¼ millions; 1864, under 10 millions; 1865, 6¾; 1866, to June, 3¾ millions.

ITALIAN COMMERCE.—The imports of wine into Italy seem to nearly balance the exports, so that the wine-producing industry of Italy does not appear likely to sustain a competition with the corresponding industry of France or Spain. Italy possesses at the same time the elements of a great viniculturel prosperity. What is wanted is a diffusion of good methods of culture and manufacture, and a classification of the products of the vineyards of the country, besides a more general union of the vine-growers in a common interest. The imports of wine in 1854 to Italy amounted to 28 millions of litres, while the exports were 30 millions. In the first nine months of 1865 the imports were 17 million litres, and the exports 17½ million litres. Silk, which is one of the lucrative branches of the national industry of Italy, has been afflicted in its production during the past twelve years by disease in the silkworms and in mulberry trees. The crop of silk has diminished to 2,000 tons annually. Attempts have been made in Italy, as in France, to remedy the evil by considerable purchases of foreign seed, but of late years the results have been generally unfavourable. In 1866, however, worms of Japan crossed with those of Italy have furnished some good cocoons; the indigenous worms have also succeeded passably, notwithstanding the adverse influence of a wet and cold May.

BADEN HOPS.—The hop trade in Baden is of great extent and importance. It is carried on in Manheim by 20 firms, and the business amounts to about 20,000 cwt. annually, of the value of £300,000. About half this amount goes to Bavaria, Bohemia, France, England, Spain, and Portugal, and the other half is consumed in the country and in the other Zollverein States. The three first-mentioned countries import the best kind of Baden hops, and England is the chief consumer of the more ordinary sorts. The large hop trade to Bavaria and Bohemia is the result of the improvement in the cultivation of hops in Baden, which has taken place of late years. Baden produces in good years a crop of 23,000 cwt. The price of hops in Baden at the time of the greatest demand was 100 to 140 florins per centner (about £15 to £21 per cwt.)

Colonies.

WEST AUSTRALIA.—Mr. McRae's report of his exploratory trip from Roebuck Bay to the Fitzroy River has been published, and fully bears out the rumours previously existing as to the fine country seen. About 150 miles from the bay a fine river, named the Logue, was running east, which, after being joined by another from the south-west, appeared to lose itself in extensive marshy flats bordering a large open sheet of water, stretching north-easterly as far as the eye could reach. Nine miles further east, where the Fitzroy was struck, it was there 150 yards wide, and a current of two miles per hour. They passed over twelve or thirteen miles of country along the western bank of the river, crossing one tributary from the south and a large branch from east-south-east. The country for two miles was covered with grass six feet high; and for seven miles consisted of plains insersected by swamps and deep clay pans, and beautifully grassed, a portion being lightly timbered. On the return the country on the Logue was further examined; much of it was open plains, and some lightly timbered, a light clay soil well grassed; the main branch of the river came from the north-west, the other branch from the south-west. Mr. McRae says the country seen on and about the Fitzroy is the best he has seen on the north-west coast, and possesses all the advantages of a good sheep country.

VICTORIA.—The total income for the year amounts to £2,949,921, against £2,860,954 for the earlier half-year, showing an increase of £88,967. These totals show that, notwithstanding the political troubles, the revenues of the colony are as elastic as ever. There is a decrease of £2,691 exhibited in the customs for the year. This is a large sum, and seems to be generally distributed over articles liable to duty. The only dutiable goods which show an increase are—tea, £3,727; hops, £804; coffee, &c., £2,646. There is a very large decrease in tobacco.

TELEGRAPHS.—Negotiations are being carried on between the Governments of Victoria and Tasmania regarding the submarine telegraph cable long lying useless in Bass's Straits, owing to breakages, and which neither Government would take upon themselves to repair. The Victorian Government has, however, lately proposed to bear half the expense if the Tasmanian Government will bear the other half.

MELBOURNE INTERNATIONAL EXHIBITION.—The arrangements for the International Exhibition are being carried on with great energy. The building is advancing with rapidity, and the applications for space still continue to flow in. The most disappointing feature in connection with this undertaking is the disinclination of New South Wales to join, but efforts are being made to induce the eldest of the colonies to co-operate with the others in securing an adequate representation of colonial products. Dr. Bleasdale and Mr. Knight, the Secretary, are now in Sydney, as a deputation from the Commissioners, to endeavour to induce the co-operation of the New South Wales Commission in both the International and Paris Exhibitions. Steps are being taken to secure at the Exhibition as complete a collection as possible of the art productions of the colonies. With regard to the Paris Exhibition, there is scarcely anything to report. It is expected the French steam frigate Sybille will convey the products of the Australian colonies to Paris.

VINE CULTIVATION IN AUSTRALIA.—There has been a great extension of vine growing in the Aldbury district, very largely brought about by some enterprising emigrants from Victoria, who, not finding the climate of Geelong altogether satisfactory for the purpose, crossed the border and found what they wanted near Aldbury. The soil, situation, and climate in that locality seem all highly favourable to the production of wine, and though the industry there is comparatively new, an excellent and highly promising wine has already been produced. The prospects of the trade has been somewhat overclouded of late by dissensions between this colony and Victoria with reference to the border customs. The two countries treat each other now as foreign countries, and tax each others produce. The great market for Aldbury wine used to be found south of the Murray, in the Ovens district, and in the townships

thereabout. The duty imposed has practically arrested the exportation of the wine to that market, and as there is no adequate market north of the river the cellars are filled with unsaleable stock. The government has been frequently memorialised on the subject, but the general interest of the colony in collection of its border duties has overbore the interest of the Aldbury wine grower.

QUEENSLAND AND THE PARIS EXHIBITION.—The local exhibition of Queensland products to be forwarded to the International Exhibition at Melbourne and the Paris Exhibition, closed on the 30th ult. This colony will make a good show at the Exhibition at Paris, as most of the natural and other resources are represented.

EDUCATION IN NEW ZEALAND.—In his last report for last year the inspector of schools for Wellington gives the following statistics:—There are 30 districts, in five of which there are no schools; there are 1,083 names on the roll, and the average attendance was 724. The highest number on the roll for one district is for the Taita, 120, with a daily attendance of 90. The next is the Lower Hutt, with 100 on the roll, and a daily attendance of 90; the lowest is the Lower Rangatiku, having only nine on the roll, and a daily attendance of six. There are 34 teachers, whose salaries amount to £2,675, the lowest rate of pay being £60, and the highest £150. The inspector recommends a minimum number of householders and children should be fixed in establishing a new district.

PROGRESS OF NEW SOUTH WALES.—Between the years 1834 and 1864 the population has increased from 66,212 to 392,589, although in the meantime the flourishing provinces of Port Philip and Moreton Bay have been cut off and erected into separate colonies, under the respective names of Victoria and Queensland. The separation of these districts from New South Wales must also be borne in mind in considering the other figures now to be quoted. Thirty-two years ago these figures applied to the whole of Australia, but in 1851 Victoria was cut off, and in 1859 Queensland followed, South Australia having separated previously, yet it will be seen that, notwithstanding these vast deductions, and in spite of all other drawbacks, the progress of New South Wales has been highly encouraging. We have shown the increase of population, after giving to the separated colonies their due proportions of the 66,212 who inhabited the whole territory in the year 1834. In the same period of 30 years, and similarly omitting altogether the deductions caused by the separation of the flourishing colonies alluded to, the manufactories increased from 58 to 2,084; mills from 71 to 174; number of acres under crop, from 74,811 to 318,854; live stock, from a number which appears to have been apparently too insignificant to record, to ten millions and six hundred thousand, mostly consisting of sheep, horned cattle, and horses; coal raised from native mines, from 8,490 to 550,000 tons; shipping, tonnage inwards, from 58,532 to 607,168 tons; value of wool exported, from £213,628 to £1,628,493; gold exported, from simply nothing to £2,952,471 in the year 1864 alone, and the total exports of this colony during the same period of 30 years rose from £587,640 to £8,117,217, while the imports increased from £991,990 to 9,836,042. During the same period also the revenue increased from £205,443 to £1,693,792. These results, making no account whatever of population and wealth carried in the meantime to the credit of South Australia, Queensland, and Victoria, must show that the colony of New South Wales is sound, prosperous, and progressive.

Obituary.

DAVID RAMSAY HAY was born in Edinburgh, in March, 1798, and was, consequently, in his sixty-ninth year when he died, on the 10th of this present month of September. He began life as an apprentice to Mr. Bengo, a heraldic and ornamental house-painter, where he was a fellow-apprentice with the late David Roberts, R.A., with whom he maintained a friendship through life. Some pictures painted by Mr. Hay when quite a young man attracted the attention of Sir Walter Scott, who at once pointed out the direction in which he considered Hay's talent would be most useful; and under his advice he commenced business as a decorative house-painter, in which profession he for many years maintained a leading position. In 1828 Mr. Hay made his first essay as an author; and his first work, entitled "The Laws of Harmonious Colouring," at once obtained notice, and afterwards went through six editions. Mr. Hay afterwards published in succession the following works:—1. "The Harmonic Law of Nature applied to Architectural Design;" 2. "The Natural Principle of Beauty as Developed in the Human Figure;" 3. "The Orthographic Beauty of the Parthenon Referred to a Law of Nature;" 4. "First Principles of Symmetrical Beauty;" 5. "The Principle of Beauty in Colouring Systematised;" 6. "A Nomenclature of Colours Applicable to the Arts and Natural Sciences;" 7. "The Laws of Harmonious Colouring Adapted to Interior Decorations;" 8. "On the Science of those Proportions by which the Human Head and Countenance as Represented in Ancient Greek Art are Distinguished from those of Ordinary Nature;" 9. "The Geometrical Beauty of the Human Figure Defined;" 10. "An Essay on Ornamental Design, in which its True Principles are Developed and Elucidated;" 11. "Proportion, or the Geometrical Principle of Beauty Analysed; 12. "The Natural Principle and Analogy of the Harmony of Form;" and, 13, "The Science of Beauty." Mr. Hay's views "On the Beau-ideal Head of Ancient Greek Art," and "On the Geometric Principles of Beauty especially applied to Architecture and the Human Form,"* formed the subject of two papers and discussions before the Society of Arts some years since, and the older members of the Society will recollect the great change which Mr. Hay introduced into the Society's Great Room when, under his direction and at his expense, it was re-decorated. Mr. Hay took a leading part in all that concerned the welfare of his native city. He was one of the earliest to assist in fostering the Royal Scottish Academy, and some fifteen years ago he established an Æsthetic Club in Edinburgh, which included several men of distinction.

HENRY CHAWNER SHENTON, the historical line engraver, died suddenly on Saturday evening, the 15th instant, attacked with an apoplectic fit. He expired in less than half-an-hour afterwards. He was a pupil of Charles Warren, and one of the last of that series of eminent engravers of the pure line style, which may be said to begin with Sir Robert Strange. Continued by William Sharp, Charles Warren, James and Charles Heath, Richard Golding, Shenton, John Henry Robinson, Lumb Stocks, George T. Doo, and other eminent men, it has created the English school of this art, which takes a rank beside that of any other country. These observations apply to the engraving of figure subjects. Line engraving as a distinct art, is in the present day, ceasing in England, and is being supplanted by styles more easily executed and more mechanical, but not more beautiful. Of the series of line engravers named above but very few remain, and as one by one drops off, the number is not recruited. The best of Shenton's larger works are probably those he did from Mulready's pictures; the most widely known are probably his later plates, engraved for the Art Union of London, the most notable of which was "The Death of Cœur de Lion," from John Cross's great picture in the C Committee Room of the House of Lords. Mr. Shenton was born in 1803, at Winchester, but his family originally settled at Barwell, County of Leicester. Latterly, owing to a failure in his sight, he was not able to practice his profession. He was a man of remarkable amiability, and devoted to his art.

* *Transactions*, 1847-8, p. 447, and 1851, p. 72.

Publications ...

... SYMONS'S METEOROLOGICAL ... VIII. of this magazine ... its appearance on ... of W. J. Symons ... observer of ... especially of the ... articles on "The ... the Board of Trade," ... Yorkshire," a Table of ... "Notes on the Month."

Notes.

ROYAL CORNWALL POLYTECHNIC ... EXHIBITION.—As the notice of ... was printed before ... full account could be ... In the mechanical ... machine was ... deal of interest ... Griffin and Sons' ... the public. It was ... in comparatively large ... be melted by it ... the furnace ... doubtless be of ... wind furnace ... Sections across mining ... of porphyry and ... "killas" to the ... and geologists ... awarded to ... means of encouraging ... mine agents ...

... avoidably ... upon ... the ... Green- ... these ... others, ... oration ... pupil. ... upon this ... for a work- ... learning ... no doubt, ... college pro- ... this session ... remarks were ... upon the ... course to be ... ; and M. ... Corneille, to ... in its deepest

... THE UNITED ...

... been completed ... Practical Geology. ... of this esta- ... introductory ... increase in the ... and to some ... correct view ... industries than ... published." The ... connected with ... it priority of ... Part 2 of the

	Tons produced.
..	25,032,694
...	1,431,047
...	9,355,100
....	4,595,750
....	1,095,500
....	965,500
....	859,000
...re ..	12,200,989
....	11,962,000
......	850,000
......	1,135,000
...etshire	1,875,000
....	4,125,000
....	7,911,507
....	1,983,000
....	12,650,000
....	123,000
... the United	98,150,587

... 5,362,709 tons of coal in 1865 ... the previous year. From the ... the last five years the quantities ... home consumption have been

		Retained.	Used for each head of the population.			
		tons	tons	cwts.	qrs.	lbs.
	...15	77,657,029	3	7	2	6
	...52	75,202,986	3	4	1	2
	...212	79,890,253	3	8	1	20
	...908	83,852,965	3	1	0	21
	...79,477	[illegible]	3	13	2	24

... therefore evid... ...ly increased ... quantity of coal produc... ... own manu- ...factures, in our comm... ...res. Mr.

cannot be sold at Saïgon will be sent back to Toulon by the Colonial Administration, at the disposal of the proprietors.

MARITIME INTERNATIONAL EXHIBITION AT HAVRE.—An International Maritime Exhibition is being organised at Havre, by the Société de l'Exposition, and under the patronage of the town of Havre. It is to be opened the 1st January, 1868, and to be closed the 30th September. The Maritime International Exhibition of Havre will be a complete and grand display of the universal progress and improvement in navigation, both by steam and sailing vessels; at the same time it will show the resources of international commerce, its importance, and magnitude. It will take up in this special and vast province the fertile idea of the Exhibition of Paris, of which it will form a brilliant maritime continuation. Agriculture and fishing will also be comprised. The programme of this exhibition will contain ten classes, besides a supplementary one, relating to experiments and practical trials with regattas, which will take place during the whole time the exhibition is open, and will materially add to its interest and brilliancy.

STOCKHOLM EXHIBITION.—An industrial exhibition has for some time past been opened at Stockholm. This exhibition, which contains the products of Sweden, Norway, Denmark, and Finland, is very interesting. The iron, steel, glass, porcelain, woollen fabrics, cabinet work, jewellery, and goldsmiths' work, show the perfection that they have attained in these countries. Those of manufacturers and others interested in these matters who have not visited it, may still avail themselves of the last few days that it will remain open. The exhibition will be closed the 1st of October next. The journey from Paris to Stockholm, *viâ* Berlin, occupying sixty-three hours, there is still time to visit these rich galleries, and to examine any objects of interest.

RECLAMATION OF THE ZUYDER ZEE.—A gigantic undertaking is at the present time spoken of, for which preparatory works have already been executed. It is nothing less than the reclamation of the Zuyder Zee, on an area of 195,009 hectares, or 485,550 acres. The cost is estimated at 106 millions of florins, or £8,480,000 sterling.

COPPER MINES IN CALIFORNIA.—The working of copper mines in California has now attained such a development that it promises even to surpass, in importance, those of mercury, and justifies the prediction that it will one day become the largest copper-producing country in the whole world. The Californian copper mines are rich and numerous. Ores containing two per cent. can be profitably smelted, it is believed, at Swansea. The Californian mines give easily 10 per cent., and have already produced thousands of tons of ore giving 20 per cent. Enormous profits might be realised if the price of transport to San Francisco from the mines of Tulare, of Siskiyon, of Plumas, and of St. Bernardino, permitted the exportation of the ore. Fifteen counties, from San Diego to Del Norte, possess veins of copper will give at least 10 per cent., but while the means which of transport remains so costly only the mines nearest to San Francisco can be profitable at the present time. Amongst these the Union Mine, at Copperopolis, exported 110 tons of ore per day, of which 50 tons contained 20 per cent. of metal; but a very large portion of this is absorbed in the cost of carriage of the ore to San Francisco. To obviate this cost attempts have been made for some time past to smelt the ore on the spot. The German system of smelting is generally employed in California. By this means cakes containing from 90 to 95 per cent. of copper are obtained. It will soon be found as common as bars of gold or silver in the market of San Francisco. The ores found at present are carbonates or oxides.

Patents.

From Commissioners of Patents' Journal, September 21st.

GRANTS OF PROVISIONAL PROTECTION.

Articles, making, &c.—1898—E. Tomlinson.
Boots and shoes, fixing the soles and heels of—2260—E. Lamb and I. Middleton.
Boots, shoes, and knives, cleaning—2284—R. S. M. Vaughan.
Buildings, ceilings of—2281—C. Cetti.
Clod-crushers, &c.—2268—W. C. Cambridge.
Elastic fabrics—1870—J. Macintosh and W. Boggett.
Electric clocks—2285—A. V. Newton.
Fibres and fabrics, bleaching—2266—C. E. Brooman.
Fibrous materials, spinning—2275—G. Lowry.
Fibrous substances, preparing, &c.—2289—P. Smith.
Field artillery, carriages for—2265—J. C. Haddan.
Fire-arms—2267—E. Russ, H. and E. Hammond.
Fire-arms, breech-loading—2272—C. Reeves.
Fire-arms, breech-loading—2279—J. Leetch.
Fire-arms, breech-loading, and in cartridges and projectiles—2283—G. V. Fosbery.
Fire-arms, repeating—2224—E. T. Hughes.
Gas, regulating the supply of—2277—W. T. Sugg.
Gun and pistol locks—2287—W. P. Bardell and W. Powell.
Hoop-skirts—2264—H. A. Bonneville.
Horses, feeding—2262—H. A. Bonneville.
Iodine and bromine from kelp, extracting—2273—A. Paraf and J. A. Wanklyn.
Iron ships, sheathing—2283—H. Robins.
Lights and shades, reflecting—2210—W. Gould.
Melting furnaces—2278—T. G. Webb.
Metallic substances, boring, &c.—2247—W. E. Newton.
Mowing machines—2274—J. B. Brown.
Needle-cases—2251—E. V. Billiotte.
Ovens—2291—G. Pimm.
Pavements—2240—J. H. Johnson.
Pianofortes—2276—E. Farr and I. Gregory.
Pipe-joints—2244—C. D. Abel.
Railway carriages in motion, signalling alarms from—2269—H. Kerr.
Reaping machines—2254—J. Baker.
Safes—2256—A. W. Hosking.
Seeds, hulling and cleaning—2242—W. E. Newton.
Smoke-consuming fire-places—2263—H. A. Bonneville.
Solder—2252—A. Lebaudy.
Stone, working—2238—T. Gall.
Street gas lamps—2280—J. Wilson.
Sugar, making—2255—S. Vickess.
Textile fabrics—2249—J. O. Greenwood.
Vegetable fibres, bleaching, &c.—2236—J. M. Mellor.
Weaving, looms for—2246—J. Owens.
Weaving, looms for—2258—M. Knowles.
Weighing machines—2253—P. F. Michaud.
Winches, crank for—2234—D. Calnon.
Writing and drawing, teaching—2257—R. Frost.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Fire-arms and ordnance, projectiles for—2393—W. R. Lake.
Hat bodies, felting or sizing—2389—G. T. Bousfield.
Steam jets—2388—G. T. Bousfield.

From Commissioners of Patents' Journal, September 25th.

PATENTS SEALED.

859. C. E. Brooman.
877. T. Johnston and T. W. Rennie.
890. S. H. Salom.
894. F. P. Warren.
910. H. A. Bonneville.
914. G. T. Bousfield.
915. J. C. Martin.
920. W. Wray.
933. S. M. Martin, and S. A. and F. H. Varley.
992. J. Young.
2020. W. Smith.
889. J. Rawsthorne and E. H. Bayley.
897. J. Higgin.
898. C. T. Liernur.
901. W. Deakin & J. B. Johnson.
902. J. Gamgee.
905. T. Ryder.
913. E. Kochs, T. Reuter, and O. Henriel.
926. E. T. Hughes.
927. R. Hineson.
931. W. Reed.
936. W. Hill and T. Whitehead.
984. J. and W. McNaught, jun.
1051. V. S. Fombuena.
1129. A. V. Newton.
1149. C. D. Abel.
1772. W. McAllum.
1932. H. Calisher.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2336. C. Maitland.
2371. J. Spence.
2407. W. E. Newton.
2329. C. T. Burgess.
2330. H. Hutchinson.
2331. T. B. Daft.
2334. G. M. de Bayeli and J. F. Vigouleux.
2345. W. Gibbs and J. Holland.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2142. A. Lamb.
2202. C. Stevens.
2158. E. Jones.
2188. P. J. L. Chemmint.

Journal of the Society of Arts.

FRIDAY, OCTOBER 5, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade,* obtain the highest number of marks, with a certificate, in those subjects respectively.

CANTOR LECTURES.

The Second Lecture of Dr. Crace Calvert's Course will appear next week.

Proceedings of Institutions.

SALFORD WORKING MEN'S COLLEGE.—The members and friends of this college were pleasantly and instructively entertained on the occasion of the re-opening of the classes by a series of addresses upon the principal subjects taught in them; and these evening meetings have been well attended, and have given much satisfaction to both listeners and speakers. The most important consideration in having the first week of the college session given up to these meetings, was that the public, and especially the young men and women who might be induced to join the college, should have a fair opportunity of knowing what they might expect to do as pupils in the classes, and what course the teachers would take in going through the thirty or more lessons which have to be given before the examinations. The address on Monday evening (24th Sept.) was by Mr. Plant, upon the study of the natural sciences, and geology in particular, during which the value of a knowledge of the commonest animals and insects was illustrated, by an allusion to those which almost universally are found to associate with, and sometimes afflict the human family; and the pleasures of natural history study were described, as found on the sea-shore, the lakes and mountains, to which thousands of working people make their annual holiday. The main topics of geology only were spoken about, such as the beginning of life and its remarkable features; the first-created zoophyte; shell and plant; the growth of the earth; pre-historic man; and the materials found in the stones of the streets of Salford. The walls of the lecture hall were covered with diagrams and drawings illustrating these subjects. On the following evening the subjects of the addresses were—Elocution; the Modern Languages (treated upon by M. Moriau); and Geography. M. Moriau spoke of the necessity to an Englishman of a knowledge of a language spoken upon the continent, either German or French, and in what manner the usefulness of French to young men in commercial situations would be proved. M. Moriau announced that he would open a class for young women, if twelve could be found willing to join, upon terms similar to those of his young men's class. In the absence of Professor Greenbank, who was unavoidably engaged elsewhere, Mr. Plant made some remarks upon the study or practice of elocution, and mentioned the great popularity of the classes under Professor Greenbank, which the college had hitherto possessed, these classes being always more largely attended than others, although no prizes were obtainable for the best oration from the lips of the most perfectly trained pupil. Although not himself at all inclined to look upon this art of elocution as the most beneficial study for a working man, considering the few hours he has for learning any knowledge of things and life, it was, no doubt, valuable in the way it was taught by their college professor, and his class ought to be as successful this session as ever it had been previously. Some remarks were made by Mr. Traice upon these points, and upon the great importance of learning Latin. The course to be observed for the geography class was announced; and M. Moriau read extracts from Racine and Corneille, to show the power of the French tongue in its deepest tragic form.

MINERAL PRODUCTIONS OF THE UNITED KINGDOM.

The Mineral Statistics for 1865 have been completed by Mr. Robert Hunt, of the Museum of Practical Geology. Sir Roderick Murchison, as director-general of this establishment and the Geological Survey, in his introductory notice, draws attention to the remarkable increase in the production of coal during the past year, and to some tables which, he states, "give a more correct view of the progress of our coal and iron industries than any statement which has hitherto been published." The importance which attaches to everything connected with coal at the present time fairly claims for it priority of notice, although the coal returns form Part 2 of the "Mineral Statistics:"—

	Tons produced.
Durham and Northumberland	25,032,694
Cumberland	1,431,047
Yorkshire	9,355,100
Derbyshire	4,595,750
Nottinghamshire	1,095,500
Leicestershire	965,500
Warwickshire	859,000
Staffordshire and Worcestershire ..	12,200,989
Lancashire	11,962,000
Cheshire	850,000
Shropshire	1,135,000
Gloucestershire and Somersetshire	1,875,000
Monmouthshire	4,125,000
South Wales	7,911,507
North Wales	1,983,000
Scotland	12,650,000
Ireland	123,000
Total produce of the United Kingdom	98,150,587

This gives an increase of 5,362,709 tons of coal in 1865 over our production in the previous year. From the tables it appears that in the last five years the quantities exported and retained for home consumption have been as follows:—

	Exported.	Retained.	Used for each head of the population.			
	tons	tons	tons	cwts.	qrs.	lbs.
1861	7,855,115	77,657,029	3	7	2	6
1862	8,301,852	75,202.986	3	4	1	2
1863	8,275,212	79,890,253	3	8	1	20
1864	8,809,908	83,852,965	3	1	0	21
1865	9,170,477	88,980,110	3	13	2	24

It is therefore evident that the largely increased quantity of coal produced is consumed in our own manufactures, in our commerce, or for domestic fires. Mr.

Robert Hunt shows, by another tabular statement, that for the same five years there have been used for every branch of our iron manufacture the following quantities:—

	Coal consumed in making iron.	Leaving for all other purposes.	Or for each head of the population.			
	tons	tons	tons	cwts.	qrs.	lbs.
1861	22,273,762	55,883,267	2	7	3	3
1862	23,552,107	51,650,879	2	3	0	13
1863	27,013,082	52,877,171	2	5	2	23
1864	28,715,439	55,137,526	2	6	0	3
1865	28,783,052	59,197,068	2	9	0	8

For the purpose of rendering this history of the coal trade as complete as possible within the limits to which at present the inquiry could be extended, returns of all the coal brought into London since 1834 are given, a detailed statement of all the collieries sending coal to the metropolitan district since 1854 and the prices of Newcastle and Sunderland coal in the London market during each month since the year 1832. From these it appears that in 1834 by sea and canal London received 2,080,547 tons, and in 1844, 2,563,166 tons. In 1845 the railways began to bring coal to London, the quantity in that year being 3,461,199 tons. In 1854 there was an advance to 4,378,732 tons, and in 1864 to 5,476,426. The quantity brought within the metropolitan district last year was 5,909,940 tons.

Iron.—Of iron ore we appear to have raised from our iron mines and collieries 9,910,045 tons, which is valued at the place of production at £3,324,804 13s. 2d. This was used to feed 656 blast furnaces, from which flowed forth 4,819,254 tons of pig iron. Of this we exported 543,018, and upon the remainder 6,407 puddling furnaces, and 730 rolling mills were employed in converting it into finished iron.

Tin.—The quantity of tin produced in 1865 was larger than that obtained from our tin mines in Cornwall and Devonshire in any previous year, amounting to 15,686 tons of tin ore, of the value of £867,435, from which 10,039 tons of metallic tin was obtained. The quantities of tin ore produced during the previous five years have been as follows:—

	Ore raised.	Price per ton of ore.		
	tons	£	s.	d.
1860	10,462	71	11	0
1861	11,640	62	7	0
1862	14,127	59	14	0
1863	15,157	63	12	0
1864	15,211	60	17	0

The increase of production has strangely kept pace with a steady decline in price, until in 1865 the mean average price was £55 6s. The system under which our tin mines have long been worked renders it necessary to meet the exigencies of the share market, that at any cost calls may be avoided and dividends declared. Hence, as the price has fallen each mine has poured more tin into the market to put off for a short season the evil day which must soon arrive. Seeing that very large quantities of tin are steadily arriving in this country from Banca and Billiton, and that the Dutch merchants hold 7,690 tons of tin, available for the coming twelve months, there is no hope of any increase of price, until necessity, by closing many of our most productive tin-mines, reduces the supply.

Copper.—The copper mines of Great Britain and Ireland produced last year 198,298 tons of copper ore, of the value of £927,938. From this 11,888 tons of copper were smelted, which had a value of £1,134,664. The production of British copper ores has been for some time steadily declining—the ores, as shown by a table given, are becoming poorer, and the price, which was for Cornish copper ores in 1856, £6 2s. 6d., fell to £4 15s. in 1865. The imports of foreign and colonial copper have been very large, that of copper ore amounting to 82,562 tons, while cake and manufactured copper have also been largely imported.

Lead.—The total quantity of lead ore raised in the United Kingdom in 1865 was 96,452 tons, from which we obtained 67,181 tons of metallic lead, and 723,856 oz. of silver.

Zinc.—The ores of this metal—blende and calamine—have been raised more freely, owing to a slight advance in the price of the ore, than it has been for some years past. Our mines produced last year 17,842 tons of zinc ores, against 15,047 tons obtained in 1864.

Gold.—From the gold quartz which is mined from the Welsh hills in the neighbourhood of Dolgelly we have the following returns:—

	Ounces of gold.
Vigra and Clogan	532
Welsh Gold Mine	277
Castell Carn Dochan	837
Gwynfynydd	9
Cwmheisian	8
	1,663

In 1864, 2,336 ounces of gold were obtained, and in 1862, 5,299 ounces.

Sulphur Ores.—Iron pyrites has been raised during the year to the extent of 114,115 tons, the value of which is estimated at £71,174. Of this quantity 81,993 tons have been raised in county Wicklow, Ireland.

Barytes.—A mineral which is largely used to mix with white lead; there are returns given of 6,768 tons.

Arsenic.—Of the white oxide of arsenic a return has been made to the Stannary Court of 826 tons, separated from other ores, and sold in Cornwall.

The following table gives a concise view of the importance of our mineral industries:—

General Summary of the Minerals Raised and Metals Produced in the United Kingdom in 1865.

	Quantity of Minerals raised.	Value of Minerals raised.	Quantity of Metals produced.	Value of Metals produced.
Tin ... tons	15,686	£867,435	10,039	£971,[illegible]
Copper ... ,,	198,298	927,938	11,888	1,13[illegible]
Lead ... ,,	96,451	1,153,1[illegible]	67,181	1,4[illegible]
Silver ... oz.	—	—	724,856	1[illegible]
Zinc ... tons	17,842	52,478	4,460	1[illegible]
Pyrites ... ,,	114,195	71,174	—	—
Gold (quartz) ... ,,	4,280	—	oz. 1,164	5,[illegible]
Iron ... ,,	9,910,045	3,324,804	4,819,254	11,[illegible]
Coal ... ,,	98,150,587	24,537,621	—	—
Earthy minerals and others, returned ...	—	774,466	—	—
Earthy minerals, not returned, estimated ...	—	650,000	—	—
Metalliferous ores & metals, other than above, estimated ...	—	—	—	1[illegible]
Total value ...	—	£[illegible]	—	£15,[illegible]

The following, therefore, represents the total value of the productions of our mines and collieries in 1865:—

Metals obtained	£15,773,287
Coal	24,537,621
Earthy minerals (not including ordinary clays and building stones)	1,434,496
Total	41,745,404

The Mineral Statistics give, as the latest and best account of the coal produced on the continent of Europe and in America, the following returns:—

	Tons.
France, 1865	11,300,000
Belgium, 1862	9,758,223
Prussia, 1863	10,074,816
Prussia, 1863 (brown coal)	4,003,044
Saxony, 1863	1,902,175
Saxony, 1863 (brown coal)	428,615
Grand Duchy of Baden, 1864	12,338
Hanover, 1863	287,415
Hesse and Nassau, 1864	79,296
Electoral Hesse, 1865	308,150
Electoral Hesse, 1865 (brown coal)	170,600
Bavaria, 1862 (coal)	221,220
Bavaria, 1862 (lignite)	45,570
Zollverein, 1863 (coal)	16,906,707
Zollverein, 1863 (lignite)	5,459,494
Austria, 1862 (coal)	2,265,228
Austria, 1862 (lignite)	1,786,679
Russia, 1863	6,350,000
Denmark, 1864	2,775
Sweden, annually	30,000
Holland, annually (inferior)	18,000
Portugal, annually	14,500
Switzerland, annually	15,100
United States of America, 1864	14,593,659

BRITISH ASSOCIATION, 1866.

On a New Process in the Manufacture of White Lead. By Peter Spence, Esq.

The following paper was read in the Chemical Section:—

White lead is one of the staple chemical products of almost first necessity. It has long been in use as the basis of nearly all the pigments employed in oil painting, few, if any, of the colouring bodies having the qualities that are required for painting in oil; and although, from its susceptibility to discoloration on the slightest contact with sulphuretted hydrogen, and also from its poisonous character, substitutes for it have been eagerly sought after, as yet nothing has been found to supersede it. Anhydrous oxide of zinc has to a certain extent been introduced, but does not appear to make any way. It has not an equal covering quality with carbonate of lead; but its chief defect is its want of permanency. White lead forms an almost indestructible compound with the oil, while oxide of zinc forms only a mixture. The various modes that have more or less been adopted in the manufacture of white lead are historically known to those interested in chemical manufactures. Almost all of these processes are based on the action of acetic acid upon lead or lead oxide, with the exception of the process patented by Pattinson in 1841, which is founded on the decomposition of galena by hydrochloric acid, the formation of chloride of lead, and the decomposition of the chloride by alkalies or by alkaline earths, such as lime or magnesia. Practically, this process is now confined to the production of oxychloride of lead, which seems to act with oil to a great extent like white lead. The oldest, most successful, and most generally practised mode of producing white lead, is that called the Dutch process; by this mode the object is accomplished by placing castings of pure lead of a suitable form one over another in stoneware pots, in the bottoms of which acetic acid or vinegar is poured; the pots are then loosely covered and piled in masses, the whole being then covered over with spent tan or some other slowly fermenting body, which will generate a small degree of heat for a considerable period. This evaporates the acetic acid, which acts on the lead, oxidising it and partially carbonating the oxide, and in about eight weeks the greater part of the lead is corroded and converted into oxide and carbonate of lead, the acetic acid is spent, and the crude lumps of white lead are ground, any metallic lead left being picked out, and after washing, the article is ready for use. Nearly all the white lead now made in this country is by this mode. The German and Austrian process is the same in principle as the Dutch, but differs in detail. A good many attempts at the manufacture of white lead have been founded on the fact that acetate of lead in solution has the property of dissolving lead oxide, forming a basic compound.

My reasons for presenting to the Chemical Section of the British Association a process which may at first sight appear only as one of the many futile attempts to improve upon the established mode of producing white lead are two:—First, that the process is new, being in altogether a different direction from any attempt that I can find recorded, and although based upon a known law, yet that law never having been seen to point to this process, it is technologically a discovery. My second reason is, that a very important feature of the process as distinguished from all others is, that by it white lead can be manufactured from materials now useless. All other modes deal either with the purest metallic lead or equally pure oxide of lead. Pattinson's process must deal either with the purest galena, free from iron or copper, or the chloride of lead must subsequently be freed from contamination by these metals or others, before it is used for the precipitating of oxychloride. By the process I shall now describe, any ore or mineral that contains eight or ten ounces of lead can be used for the production of white lead, and it is of no consequence what other metal the mineral contains; the process separates the lead directly without touching the other constituents of the mineral, and the white lead is perfectly pure. This being so, practically, I expect that all the white lead required may be made from ores or minerals now consigned to the rubbish heap as being too poor to work; and I know of large quantities of minerals useless as lead ores which will be economically adapted for the production of white lead. The process is based on the fact that oxide and carbonate of lead are soluble in solutions of caustic soda or potash, and are insoluble in the carbonates of these alkalies; the process, therefore, is effected by taking any mineral that contains oxide or carbonate of lead, or lead in any form that can by calcination or otherwise be converted into oxide or carbonate of lead, and by either macerating or boiling the mineral in a caustic solution all the lead is dissolved and extracted in a limpid and colourless solution. If the mineral contains oxide of iron, copper, or zinc, the caustic solution does not touch any of these oxides, and only attacks the lead. The lead solution has now passed into it carbonic acid gas, by which the alkali being carbonated, the lead is instantly precipitated as oxide and carbonate. The alkaline solution is now causticised by quick lime, and is ready for a second action on mineral containing lead oxide. The precipitated white lead has only to be washed to separate the solution of carbonated alkali, and then dried for use. A sample of it is on the table. It has been tried for painting, and is said by the painter, who had it used in various ways by his workmen, to be equal to any white lead he could procure. It has also been tried as a glaze in the potteries, and declared to be equal to any white lead the firm had in stock. As the process, at least in the laboratory, is a rapid one, if it would at all gratify the Section, I have the materials at hand, and can show it all in half-an-hour. The substance from which I shall now extract pure white lead had the following composition before calcination. I have brought the materials already calcined, as the calcination could not have been done here. Analysis:—Zinc, 30·656; sulphur, 26·483; silica, 19·154; lead, 13·148; iron, 9·121; copper, 1·027; alumina, 0·216; silver, 0·022; moisture, 0·122; total, 99·949.

Mr. Spence then demonstrated by experiment the manufacture of white lead upon the principle given in the paper.

THE SORGHUM SYRUP CROP.

The following is from the *American Agriculturist*:—

We know of no other crop ever having been intro-

duced among agriculturists which grew so rapidly in popularity as has the sorghum. Many circumstances have conspired to render the product more valuable than could have been expected when it was first introduced; and now, after ten years' experience, we have seen it grow constantly in favour, and its culture so extend, that in many districts, in widely different parts of the country, it is regarded as one of the staple crops, ranking with corn, potatoes, wheat, &c., in importance. The profits per acre, at the present price of sugar, are larger than those yielded by any of the staple crops, except perhaps tobacco and hops. We have never known any one who began to raise it, and who possessed a mill and evaporator, or could easily get his cane to them, who gave it up.

The syrup—gained by simply boiling the expressed juice, skimming of the feculent matters which rise as scum to the top—is often of very good quality; and under other circumstances of soil, manuring, maturity of the cane, &c., it is very poor, acid, and coloured; still the poorest qualities may be purified and refined, so that it all has a market value, especially in those parts of the country where it has been most grown. The improved evaporating-pans, of which several claim the favour of the public, enable a common hand, with a modicum of judgment, to produce clear well-flavoured syrups in most cases, which sells as high as or higher than good West India molasses, and answer all the purposes for which that is used in our kitchen economy. The prospects now are, if the weather continues favourable, that the yield of syrup this year will be vastly greater than ever before.

Within a year or two the discovery has been announced, and to a good degree confirmed, that the earlier the cane is cut the more sugar is obtained in a crystallizable form. We have always held that the quantity and quality of the sugar separated from sorghum syrup was such that it was much better not to aim at its production, but rather to produce syrup. What we have seen, with the exception of a few samples, was gummy, lacking in sweetness, and not as thoroughly crystallised as good sugar should be. However, if it be a fact that cane cut and worked early will yield a paying per-centage of good sugar, it may greatly alter both the product and the profits. It must be remembered that green cane abounds in feculent matters.

In harvesting the Sorghum, it is primarily necessary to cut it before hard frosts, and to have it housed or protected from them. It is immaterial, probably, whether the topping and stripping be done at once, or later; and practice differs. The stripping is conveniently done by the hands, which must be protected with leathern mittens, or, what is better, square pieces of kip skin, to cover the palms, in which a fold may be sewed for the thumb to go in; and if necessary a strap may be sewed upon the back to go over the two middle fingers. As the cane stands, it is stripped from top to bottom at one motion, the leaves being laid between the rows. After this is done upon as much ground as it will take several hours to cut, the stalks are cut at the ground, and laid between the rows in gavels, resting upon the leaves to keep them out of the dirt. The tops, with about three feet of stalk, are cut at the same time, so that the gavels of cane may be bound at once. The bundles should be of a size convenient to handle, and bound with two bands, which may be made of the leaves, if not too dry. The tops are also bound in sheaves, to be cured and fed out in the bundle or threshed. The leaves make very good dry fodder, being considered superior to corn fodder, of which, however, we have some doubt, for we value corn fodder very highly. These operations are laborious and tedious, so much so that at the west, where the relative value of labour is high, some farmers do not strip, but pass both stalks and leaves through the mill, even at a loss of considerable juice in the more bulky bagasse. The cane is best when the bundles are at once removed to the shelter of a roof of some kind; but when this is not practicable it should be piled up like cord wood, and covered by a course of boards laid edge to edge and battened, or laid to break joints, thus =‾=‾=, or in some other way, protected from the weather and from freezing. It may be worked any time before hard freezing weather.

The time to cut the cane is said to be when the seed begins to turn brown, that is, when it is in the milk. At this time certain changes are going on in the stalk, which are not perfectly well understood; this much, however, is certain, that some cane sugar exists there, together with a considerable portion of the grape sugar, that the former is converted into the latter in the process of ripening, and that, as the ripening progresses, a considerable portion of the grape sugar is converted into starch and woody fibre. It is probable also, that at an early stage much fruit sugar exists in the Sorghum. This differs from grape sugar in being much sweeter, and never assuming the crystalline form. Cane sugar crystallizes very readily, as we all know, for this is the common sugar, brown and white, which we use, derived from the southern cane, from the maple, from the beet, &c. Grape sugar is much less sweet, five parts sweetening as well as two parts of cane sugar, or of fruit sugar, which is as sweet as cane sugar. Honey contains both grape and fruit sugar. That portion which solidifies when honey becomes candied, is grape sugar. When grape sugar crystallizes, it usually forms needle-like crystals, grouped in such close masses that no crystals can be seen. It attracts moisture from the air, and becomes a pasty mass. Most of the Sorghum Sugar we have examined is a mixture of cane sugar crystals, which are very distinctly seen, together with the gummy mass of grape sugar, and more or less molasses. When cane sugar is subjected to the action of a ferment, or any acid, it changes rapidly into an uncrystallizable sugar, which in its acid and more or less impure state we know as molasses, and which is very similar to, if not identical with, fruit sugar. The juice of the Sorghum contains more or less acid, a green substance which is a very active ferment in its natural state, and which, on being changed by boiling, if any be left in the syrup, gives it a disagreeable flavour.

It is important that the canes be bundled and kept so that they will not be bruised, whereby air would come in contact with the juice, and corrupt it. They should be thoroughly ground, as it is called, that is, passed between rollers, so as to express all the juice possible at one operation. The juice should be exposed in the least possible degree to the air, and, if delay be unavoidable, a very small quantity (one or two pints to one hundred gallons) of bi-sulphate of lime should be added, the operation of which is to arrest any incipient fermentation. The juice should be boiled down in flat pans as rapidly as is consistent with thorough skimming. If it is very acid, milk of lime is added, seldom more than a pint to thirty gallons. Towards the latter part of the operation, the syrup should not boil, for the albuminous gummy substance will rise like cream upon the still surface, and may be removed. If the boiling continue rapid it will not rise, but remain floating in minute particles through the syrup. The syrup is evaporated until it has, on cooling, the thickness of molasses.

There are several evaporators of well established reputation, with which, as we have said, any one of common sense can make good syrup, and if the juice contains cane sugar, this may also be obtained. To this end the syrup is evaporated considerably more than the consistency named, namely, to thirty-eight or forty degrees of Beaumes' Saccharometer, while twenty-five to thirty degrees is a sufficient density for syrup. On cooling and stirring, the sugar forms, and may be separated in a crude state by draining off the molasses.

M'INDOE'S TRANSPLANTING MACHINE FOR LIGHT WEIGHTS.

The following is a description of this machine, for which a prize of £5, given by the Society of Arts, was

awarded at the International Horticultural Exhibition to the inventor, Mr. M'Indoe, gardener to Mr. Coles Child, of Bromley Palace, Knet*:—

This implement is capable of transplanting trees or shrubs of from five hundred weight up to nearly two tons. The machine can be passed through a four-foot gate, over narrow walks, grass lawn, &c., without doing any injury. It has two wheels or rollers, three feet in diameter and thirteen inches across. Between these, fixed on the same axis, is a narrow cog-wheel, two feet eight inches in diameter, and over it a ratchet wheel, nine inches in diameter, the turning of which with the handles enables the operators to move the machine backwards and forwards without difficulty. The pole over the wheels is supported by strong iron bands (one by three inches), and when level is five feet six inches high, 17 feet long, and, with the addition of the auxiliary pole, can be extended to 22 feet. Along the sides, where the greatest strength is required in leverage, iron bands (two inches by ⅜ of an inch) are inlayed in the wood. There are prongs extending from the end of the pole, two feet six inches long and the same dimensions across the points. They are covered with canvas stuffed with moss, to prevent the sharp edges rubbing the bark of the branches of shrubs. From these prongs are suspended two belts, made of strong tarred cord, about the thickness of sash-line; they are six feet long and one foot across, with three feet of chain to each end. At the opposite end of the pole are two small wheels, 18 inches in diameter, and there are hooks under the pole, for hanging half-hundred-weights, which, with two more hung on the axis of the small wheels, are found of great use when the machine is loaded.

When a tree or shrub is to be transplanted the operators commence in the usual way by digging out a trench, at a safe distance from the stem, and, with a pick and fork, work towards the place, taking all possible care of the small roots, and pegging them up as the work proceeds, till the plant stands on a pivot of about a foot in diameter. Then the belts should be placed cross-ways round the ball, and the machine should be backed (if on two planks all the better). The small wheels should then be taken off, and a rope put round the end of the pole, which should be raised till the chains can be hooked on to the prongs. The pole must now be pulled back again, and if a block and tackle be at hand they will be found of great service in this operation. When the pole is got down again put on the small wheels and weights; and with two men at the end of the pole and four at the handles, a tree a ton in weight may be moved anywhere if the ground is tolerably hard and level.

In this way the inventor has within the last two years superintended the transplanting of upwards of 100 trees and shrubs, including evergreen oaks, and conifers, (from 10 to 30 feet high), yews, hollies, Portugal laurels, the lauristinus, the arbor vitæ, the juniper, &c., from six to ten feet high. With the exception of two large trees, which were transplanted under very unfavourable circumstances, every one of these is said to have turned out a success.

* See present vol. of *Journal*, p. 577, class 231 C.

DRYING OF GRAIN.

The continued wet weather during the late harvest directs attention naturally to the importance of systematic and effectual arrangements for drying and storing of corn. Hitherto there have been little or no advance in this direction in this country, and the method usually adopted has been that of the ordinary kiln, without any or with scarcely any improvement, which modern science and skill have adopted in other operations. Various plans have been at different times suggested, and many years ago Mr. Bodmer had a plan which he patented for submitting the corn to a stream of dry air, the corn being kept continually in motion, so that every grain was brought into contact with the air. There were also other plans on the same principle brought forward, but the idea never seems to have taken root in this country. It appears, according to the *Times* correspondent at Verona, that there the government have adopted a system of this character. He says, "It is a patent of a Frenchman, Devaux by name, and is most complete.

"Everyone knows how difficult it is to preserve grain for a long period from damp, worms, rats, and other 'small deer,' and a system that will effect this is worth much expense when this is compared with the value of the lives that depend on a due supply of wholesome food. The reservoirs intended to convey the corn are 130 in number, each of them being 42 feet (Austrian) in height and 7 feet square, made of iron plate pierced with small holes all over its surface. A hollow cylinder of the same metal, also pierced with holes, runs up the centre of each reservoir, and communicates at the bottom with a tube through which a blast of air can be driven by a fan when required. I was informed that each reservoir will contain 1,000 measures of 45 lbs. When a new supply of grain is to be brought in it is run into the establishment in railway trucks, and the sacks are emptied into square receptacles, consisting of large iron boxes let into the ground, and from this time forth the food is touched by no hand of man till it is taken hot out of the oven in the form of the excellent bread supplied to the soldier. To carry the corn to the top of the reservoirs an endless leather band, covered on its exterior surface with a number of buckets, is employed. The apparatus on this principle most familiar to the general reader is probably the machine used to clear the channel of a river from mud. As the hand revolves by the action of a steam engine each bucket scrapes up its share of grain and conveys it to the top of the house, dropping it into long iron troughs, which pass over the tops of all the reservoirs.

"On each trough works an Archimedian screw, which passes on the corn without ceasing to its furthest end, or drops it into any selected reservoir by the opening of a small door in the bottom of the trough. There is, of course, a door above each reservoir. When one is filled the door is shut and the next opened, and so on. If the wheat or oats are dry and clean when put in, the natural circulation of air through the centre shaft and the holes in the exterior of the iron reservoir cases is sufficient to preserve it for some time; but if more drying is needed, or it be required to guard against worms, &c., the top of the centre tube is closed, and air blown into it from underneath. The draught, having no means of exit except through the numerous small holes, is thus driven through the corn, and not only dries it but creates such a vibration as to render the life of any worms that may be in it such a burden to them that they cannot enjoy domestic ease nor bring up their young, but are driven, Tantalus like, to despair in the midst of plenty. But even this is not considered sufficient. The great weight in each reservoir might cake some of the corn at the bottom, and in any case a little circulation is good for it, so shutters are provided at the bottom of the reservoirs, near the ground, to let out the corn when necessary. Spouts under the shutters convey the grain into troughs with Archimedian screws; and these lead it, tumbling over and over, to the endless band and buckets which raise it again to the top, where it goes through the usual routine, having been well mixed on its way. Then there are steam mills for grinding, steam apparatus for mixing the dough, and small carriages to run the bread into the ovens, of which there are twelve."

A commencement, however, seems to have been made in introducing this system into England, and a company is carrying it out on a large scale. A granary has been erected at Canada Wharf, Rotherhithe (capable of holding about 50,000 qrs.), which granary is likely to be considerably increased. The invention, it is hoped, will be a great boon to the grain

trade and the public at large. Since the granary was opened in June, 1865, its value has been tested in bringing into condition, in a very short space of time and at a very moderate expense, parcels of grain arriving after a long sea voyage in a heated condition, and by keeping in good condition the grain warehoused in the granary.

The secretary of the company writes as follows:—

"To show that this system of granary is now beginning to be appreciated as it should be, I may mention that the Lombardo-Venetian Railway Company constructed three years since a granary at Trieste capable of storing 100,000 qrs. of grain, which is now working to the entire satisfaction of the company. It is, probably, the largest granary in the world. The Austrian Government constructed for military purposes two granaries of between 30,000 and 40,000 qrs. each, one at Bruck and the other at Verona, the latter described by the *Times* correspondent. Another of 12,000 qrs. exists at Liverpool; and I may say that in all these granaries, hard labour being superseded by steam power, the cost of working is less and the work is better done, and they thus give the greatest satisfaction to their owners and the public. The directors will have pleasure in allowing any of your readers to inspect their premises on applying to me for an order for that purpose."

"A Colonist," writing to the *Times*, refers to the means adopted in Ceylon as regards the coffee crop, and says:—

"Coffee is cultivated in Ceylon at from 1,000 to 4,000 feet of elevation above the sea. The lower grown coffee is ripe some weeks before that grown on the higher ranges, and the weather and climate of the lower lands are generally more favourable to the processes which have to be adopted. These, so far as they are carried on at plantations, are to pass it through a machine which deprives it of its pulpy, juicy covering, to wash the mucilaginous matter from the beans (still covered with a parchment skin), and afterwards to dry them.

"As often happens after a few partial gatherings, a crop of many thousand bushels becomes ripe altogether, and requires to be gathered at once or the fruit will fall to the ground; much anxious care and watchfulness is required to dry all off without injury to the quality and value of this very delicate staple. On the lower estates, thanks to a powerful sun, this is generally accomplished by spreading the coffee to dry on the barbecue or mortar-laid platform, or even on mats. But on the higher plantations, where the rains fall almost continuously during the earlier monsoon months, artificial means have to be resorted to so as to dry the produce that it may be sent to the shipping port in good condition, to be finally prepared and sent to Europe. Mr. Clerihew's patent, of which a model appeared at the Exhibition of 1851, accomplishes this object perfectly, and is almost universally adopted in this island. It consists of fanners, worked by a waterwheel or any other power, to draw a stream of dry air through the floors of a building on which the wet parchment coffee is laid sometimes 18in. thick. By these simple means crops which would otherwise have rotted in the store are made to reach the port in the most excellent condition. Cannot something like this be applied to corn in wet seasons, first to the ears accurately taken off by a machine for that purpose, and then to the straw?"

The importance of the subject at the present time cannot be overrated, and the suggestion is thrown out that to each corn-milling establishment, where the business is sufficiently large to warrant it, an arrangement of a similar kind to the above should be attached in lieu of the old-fashioned kilns which some of them now possess. The proprietors would then be enabled to apply the system to and turn to account the home-grown damp wheat of their own neighbourhood, which without it could not be used.

INUNDATIONS IN FRANCE.

France is suffering from one of those accidents which at irregular intervals cause such sad destruction of property and even of human life. The long continued and heavy fall of rain, happily now replaced by delightful summer weather, has caused many of the rivers to overflow their banks, laid many thousands of acres under water, and interrupted the traffic in several parts of the country; the districts which have suffered most being the lines of the Bourbonnais, of Bordeaux, of Nantes, and of Mont Cenis. The Seine at Paris has overflown its banks in several places, and its waters are filled with mud, vegetable matter, casks, timber, and all kinds of miscellaneous objects, and several of the floating baths have been seriously injured. The cellars and basement floors of thousands of houses are under water. The amount of water predicted for the 27th and following days of September was 6.35 mètres of the guage of the Pont Royal, but the level has risen to nearly, if not quite, seven mètres; this is a greater depth than has been known since the year 1802, when it was 7.32 mètres; in 1807 it rose to 6.70, in 1836 to 6.40, and in 1850 to 6.05; the highest altitude recorded was in the years 1615 and 1690, when it reached 8.93 mètres. The augmentation has not exceeded 70 to 80 centimètres. At Bercy the streets have been under water, and the whole of the wine on the quay there had to be removed in the greatest haste. It is feared that several lives have been lost, but only one has been authenticated; several horses and other animals have been swept away by the flood, which, amongst other unusual things, brought a sturgeon up to the quay of the Louvre.

On the Lyons railways beyond Charenton, the rivers Seine and Marne are converted into vast lakes, which cover the meadows for miles and to a great width; factories, farms and houses stand in four or five feet of water, and the trunks of trees are nearly hidden from sight; immense quantities of grain, &c., have been lost, hundreds of stacks standing half under water, and many more fallen and being washed away by the flood. In one place the River Marne had burst through and washed away an embankment, and the earthworks of the railway were slightly injured; gangs of men were repairing the damage as we passed over the ground on Friday, the 28th of September. Detachments of military engineers have been sent to the Orleans station with pontoons, and for the relief of the surrounding country. This last town seems to have suffered very severely, the condition of the Loire being described as terrible; the trains were interrupted on the nights of the 27th and 28th, by the destruction of a portion of the line of railway between Orleans and Saint-Cyr-en-Val, and four hundred inhabitants of the rural districts found shelter from the authorities of the former town. The whole of the valley of the Nevers was under water, and it was greatly feared that the embankment there would be thrown down. At Cosne and Saint Hilaire, and many other places, the banks of the river were broken through. At Beaugancy a breach was formed in the embankment of the Valley de Cléry, just below an iron bridge constructed there after the inundations of 1856. At Tours also the dikes were destroyed and part of the town inundated. The traffic on the Bordeaux line, in the department of the Indre-et-Loire, was suspended for several hours. At Amboise the banks were washed away to the extent of a thousand feet, and the town inundated. The damage done in the valleys of the Loire and the Allier are very serious, the railways having been broken up in several places. Bridges were carried away at Misy-sur-Yonne and several other places. Even small tributary streams, such as the Lonig, which falls into the Seine, have laid many hundreds of acres under water, and utterly destroyed outlying crops.

Accounts from Savoy are still worse; in the Haute Maurienne, the imperial route which leads to Italy is

destroyed to the extent of four or five miles, by breaches in several places between Termignon and Saint Jean de Maurienne, and it is feared that it will take two months to re-establish the road.

PRIZES IN ARCHŒOLOGY AND HISTORY OFFERED BY THE FRENCH GOVERNMENT.

The Minister of Public Instruction has just issued the list of subjects for which the learned societies of the provinces are invited to compete during the three coming years.

A prize of the value £60, or two or more making together an equal amount, is offered for the best work or works on Archæology, published in the memoirs of the learned societies of the departments or sent direct to the Minister. A prize of like amount to be awarded to the society that shall send to the minister the best glossary of the patois or rustic dialect of any district of the country. A third prize of the same amount is offered to the society that shall furnish the best memoir on the following subject:—Indications respecting the Commerce and Industry of the Middle Ages, derived from authentic documents, referring either to a province or to a town, with special reference to the following points:—The practices and rules of trades; the condition of workmen, employers, and dealers; the nature of the commodities; prices; modes of fabrication; meetings of tradesmen and fairs; the commercial relations of towns and populations amongst themselves; rates of salaries and wages; and exchange and value of money.

It should be explained that the whole of the learned societies of the provinces meet together once a year in Paris, when various questions are discussed, plans adopted or suggested for the coming year, and prizes announced, under the presidency of the Minister of Public Instruction. Such a union of provincial societies seems eminently calculated to stimulate the vigour and add to the efficiency of all; it is, in fact, a kind of French association for history, archæology, and cognate matters.

ADULT EDUCATION IN FRANCE.

This is being materially aided by the importance given to the distribution of rewards all over the country to the teachers of the adult classes; the awards consist of medals given by the Emperor, the Prince Imperial, the *Conseils-Généraux*, and private persons, of books given by the Minister of Public Instruction, and of a new decoration called the University Palms, two small palm branches in silver, relieved by a thread of violet-coloured enamel along the stems. The prices of the railway tickets, with the exception of the Orleans line, are reduced for the occasion, and the teachers flock to the meetings in large numbers. At all these meetings addresses are delivered by gentlemen representing the Government and the local authorities, and the enthusiasm is general. In the Aisne there were about five hundred teachers at the meeting, and they assembled afterwards at the Hôtel de Ville, and sent an address to the president, M. Hébert, questeur of the Corps Legislatif, ending with the following phrase:—"We all undertake to work during the coming year to surpass, if possible, our worthy rivals of the eastern part of the empire, and so as finally to triumph over ignorance, and to rejoice the heart of the father of the country!"

At Calvados, the Prefect received twenty decorated teachers at his table; two hundred teachers came from Caen alone to the meeting. In the Haute-Garonne the Comte d'Ayguesvives, Chamberlain to the Emperor, and the deputies of the department were present; and an eye-witness, writing to the minister, says, "An expression of gratitude was painted on all countenances, and enthusiastic cries escaped from every breast." The department of the Ille-et-Vilaine stands lowest in the educational scale of France. The meeting at Rennes was attended by the Archbishop and all the dignitaries of the neighbourhood; and the Inspector of the Academy expressed a confident hope that Brittany would soon be placed in this respect on a level with the other parts of France. At Châteauroux, M. Charlemagne, deputy, said, "Under a system of commercial liberty, the prosperity of nations is necessarily subordinate to the instruction of the masses; and in France we have not the time to wait for the results of education given to children, hence the importance and the urgency of adult instruction." At Tarbes the cross of the Legion of Honour was presented to M. Bordère, a teacher at Gèdre, amidst a perfect storm of applause. The scenes are said to have been similar in all parts of the country, and the accounts of the disinterested labours of the poorly-paid teachers in establishing and conducting adult classes in their schools reflect the highest honour upon that useful but humble class.

The Consul-General of Mayenne has just founded, at the proposition of the Prefect, a grand prize, consisting of a gold medal of the value of 250 francs (£10), in favour of the teachers of the adult classes in the department. There is no doubt that the rewards and recompenses thus publicly given to the teachers, the honours distributed by the Government, and, perhaps, more than all, the *éclat* thrown over these annual meetings will have an immense effect in inciting the schoolmasters to further efforts, and will, moreover, arouse hundreds of poor men and women from the intellectual torpor into which the want of a knowledge of the elements of education has plunged them. If adult ignorance continues to be combated against by such means as these, the number of those who can neither read, write, nor cypher will be very rapidly diminished, and other countries must look to themselves if they wish not to be left behind in the race.

Fine Arts.

Exhibition of the Works of the late Godfrey Sykes.—In the South Kensington Museum have been, and still are, on view 212 sketches, designs, paintings, and modelled works, which determine the precise position of the artist whose early death the public have cause to deplore. Godfrey Sykes, as pupil, pupil teacher, and master in the Government School at Sheffield, is justly claimed as a successful product of our national system of art education. Twelve years ago, while yet a student at Sheffield, he executed the "design for bronze gates for a school of art," here exhibited, which gave proof both of individual talent and of early and unmistakable predilection for the schools of Michael Angelo and Raphael, to which he became devoted. Six years later he was invited to London, to design and execute the terra cotta decorations in the arcades of the Royal Horticultural Gardens. The material, though used with advantage in many Middle-age buildings, especially in the north of Italy, was comparatively untried in this country as a means of architectural enrichment. What power of adaptation and readiness of invention Sykes brought to this task the designs now placed before the public will indicate. Here are "drawings for the north arcade," "designs for capitals," "for spiral flutes," "for cap and centre of columns," which, as far as they have yet been executed and placed in position in the arcades, have obtained approval from architects and decorators, even of opposing schools. Certain sketches, which Sykes made during continental excursions, are specially interesting, as indicative of the sources whence he obtained art materials and ideas. The drawings made of the well-known brick enrichments in the Ospedale Maggiore, Milan, and of other scarcely less-famed examples of terra cotta in the cities of Lombardy, show how carefully our English student settled his practice on historic precedent. The two hundred and twelve works

exhibited show what were the talents and the acquired skill which obtained for Sykes the appointment of decorative artist to the Kensington Museum, and what was the nature of the labours which such an office imposed. Here may be studied "designs for the north and south courts of the Kensington Museum," "coloured sketch of one bay of the residences," "designs for spandrills in the south court," for "architectural details," for "ceilings, &c.," for "mosaic panel, containing the figure of Raphael," for "southern façade of the theatre," and for "pediment in mosaic" of the same. This theatre façade, which is advancing towards completion, will afford an example of the architectural mode of decoration which Sykes, working in co-operation with Captain Fowke, has done much to originate or naturalize in this country. The intaglio and bas-relief ornaments in moulded brick or terra cotta which travellers see as a novelty in Milan, Monza, and Pavia, will shortly find elaborate adaptations in the new museum at Kensington. The art merits, too, of decorative polychromy, which till recent years has been little practised in England, will in this façade be put to the proof. The variety and possible harmony of colour which can be obtained from bricks, tiles, mosaics, and stone, will, at Kensington as well as at Burslem, be submitted to bold trial. It is not desirable to prejudge the merits of those productions upon which there may naturally arise diversity of opinion. It is recorded in the catalogue to these drawings, that when Sykes "had scarcely breath to give his directions, he had himself drawn up by ropes to the scaffoldings, to superintend his pupils and workmen. His last work was the columns moulded in terra cotta for the new buildings. The last directions he gave were for their arrangement in front of the lecture theatre. They were being set up at the time he died." One of these columns, crowned by a composite, or renaissance capital, the shaft composed of six drums, boldly modelled in figure compositions and foliated details, may be seen complete among the terra cotta works in the museum. Sykes, by this exhibition of his works, is proved to have had that wide range of study and diversity of subject common to the immediate followers of Raphael and Michael Angelo. He was sculptor, painter, and architectural decorator. His landscape sketches show the colour which a painter might desire to transfer to structure, and the nature which the decorator learns to conventionalise. This may be a key to the pictorial treatment of architecture towards which Sykes inclined; at least it will be admitted that in the simultaneous culture of sister arts, the resources of the decorator were extended and enriched. Whether the dangers or advantages attendant on such a course be the greater, it is not for us to decide: we may, however, point out that the practise has found precedent in great historic epochs. Art-designers and art-workmen will do well to give to the exhibition thoughtful study. On the death of Godfrey Sykes, in the spring of the present year, the Committee of Council on Education recorded that, "My Lords learn with sorrow of the death of this distinguished officer," who "was selected to fill the post of decorative artist to the museum, which he has held for seven years with credit to himself and benefit to art generally. Their Lordships view his loss as a great one to the museum." It may be added that Mr. Sykes' pupils, Mr. Gamble and Mr. Townroe, have been entrusted with "the joint charge of the studio for preparing the decorative designs of the museum." And "it is their Lordships' wish that each of these artists should form under his direction a class of four pupils, selecting promising young students, who will receive an allowance for their services as soon as they are reported to be valuable."

EXHIBITION OF PICTURES OF THE OLD MASTERS AT AMIENS.—This exhibition, which opened on the 26th of August, is held in the galleries of a fine building called the Musée Napoléon, recently erected by the Antiquarian Society of Picardy, with Imperial and other aid. The collection consists of 347 pictures, half contributed for exhibition by amateurs of Paris, and the rest by local collectors. The French school is represented by Poussin, Philippe de Champaigne, Claude Lorrain, Largillière, Rigaud, Mignard, Hubert Robert, Watteau, Lancret, Boucher, Baptiste Desportes, Chardin, Nattier, Toqué, Masse, Greuze, Prud'hon, Danloux, Horace Vernet, and Ary Scheffer; the Italian by Titian, Tintoretto, Palma, Salvator Rosa, Andrea del Sarto, Paolo Véronèse, Ribera, Annibal Carracci, Dominichino, Primatice, Lucas Giordano, and Guercino; the Spanish by Murillo, Alonzo Cano, Méneses Osorio, Vélasquez, Paul de Cespédes, and Goya; the Dutch and Flemish by Rubens, Van Dyck, D. Teniers, Jean Steen, Ostade, Albert and Benjamin Cuyp, Jordaens, Govaert Flinck, Karel du Jardin, Lingelbach, Van der Neer, Terburg, Gonzalès Coques, Ferdinand Bol, Ruysdael, Hobbema, Moucheron, Everdingen, Swanevelt, Huysmans de Malines, Van der Helst, Van Utrecht; and the German by Albert Durer, Lucas Kranach, Holbein, and Denner. The collection includes works by several portraitists of high repute, of whose works there are no examples in the Louvre, such as Benjamin Cuyp, Van Utrecht, Van Es, Barent Graat, and David Bailly. There may be a few works of questionable authenticity in the exhibition, but none which do not belong at least to the school of the artist to whom they are attributed, and consequently the gallery presents a very choice appearance, and the collection forms certainly one of the best retrospective exhibitions ever seen in the provinces. The undertaking is under the patronage of the Comte de Nieuwerkerke, the Imperial Superintendent of Fine Arts, and it is said that the contributors, taking into consideration the time lost in consequence of the terrible visitation of which Amiens was lately the victim, have consented to leave their works for exhibition until the end of October. The arrangements are entrusted to the care of M. Borély, a local artist.

EXHIBITION OF FINE ARTS AT LILLE.—The rich and busy town of Lille has not had an exhibition of pictures since 1834, although the inhabitants of that place have the reputation of considerable taste for the arts; it awoke out of this lethargy this year, and its exhibition was on a very large scale, there being no less than 1,575 works on the walls. The period selected was a fortunate one, for, coming soon after the closing of the Paris *Salon*, an immense number of works were placed at the disposal of the committee of management. The catalogue contains the names of a very large number of well-known artists and some few of the *élite*. The Comte de Nieuwerkerke, Imperial Superintendent of Fine Arts, patronised the exhibition, and contributed the model of his own statue of Catinat (executed in stone for the Church of Saint Gratien), which he has since presented to the museum of the town, one of the richest in the French provinces. The sales at this exhibition reached the large amount of a quarter a million of francs (£10,000)—a handsome sum distributed amongst the fortunate artists. It is not likely, after such an amount of success, that Lille will be again thirty years without an exhibition of pictures.

THE LOUVRE.—The specimens of stained glass belonging to the collections of the Louvre have recently been set up in the windows of the apartments known as those of Henri IV.; they consist of a hundred specimens, mostly small, and illustrative of the best period, as well as the decadence, of the French, Flemish, Dutch and German schools of the fifteenth, sixteenth, and seventeenth centuries. They present a good means of comparative study in this difficult and peculiar branch of Art. A Chinese and Japanese collection, not of large extent, but consisting generally of choice specimens, has recently been opened in a set of three small rooms on the upper floor, adjoining the collection of arms, costumes, and curiosities from the Pacific and other islands at the end of the Naval Museum. A collection of [illegible]

tapestry, it is said, is shortly to be arranged, the Louvre possessing many rare and curious specimens.

Commerce.

State of Trade.—The September report of the Leeds Chamber of Commerce says, with reference to the woollen trade, that about an average amount of business has been done in the warehouses during the past month. There has been a considerable number of buyers in the market, who have bought cautiously; but, on the whole, the business done has been greater than might have been expected, considering the unfavourable weather, and the bad prospect for the harvest. The shipping trade generally has been quiet, especially to the Continent and to the United States. The manufacturers have been fairly employed, and stocks continue to be very moderate. The public sales of wool have gone off with unusual steadiness, and gradually stiffening prices, so that at the close most descriptions are quoted ½d. to 1d. per pound higher than at the commencement of the series. The foreign buyers have taken 40,000 bales. The home demand is steady and good, but without any speculative spirit. The English wool trade has been very quiet, with prices in favour of the buyer, until the latter end of the month, when a better feeling prevailed. The flax trade appears to have been unusually dull, and only a very small business has been done. Prices are without much change, but are, if anything, in favour of the buyer. The spinners are generally working full time, but the demand is but languid, and prices are not very firm. In the iron, machine, and engineer tool trades the demand for all descriptions of iron has been small, and the prospects for the autumn are not so good as could be desired. The machine makers are tolerably well employed, but the trade has not well recovered from the depression caused by the war on the Continent. The tool makers continue to be tolerably well employed, but few orders for the future are given. The locomotive makers are busy, the custom of entering into large contracts extending over a long time preserving this trade from frequent fluctuations. The cut nail trade is rather better. In the seed crushing and oil trades there has been a good demand for both rape and linseed oils during the month; prices are very firm, and the trade is in a healthy state. The large export of linseed oil to America has very much reduced the stock in Hull. Seeds are firmly held, and prices on the Continent are higher. Cakes are in fair demand for the season. Olive oil is using largely in this district, and prices are very firm; the rates demanded at the shipping ports would leave a loss to the importers. The leather trade has been very quiet in all its branches, and stocks are larger. Shaved and dressing hides have been easiest to quit, but the demand has not been large. Tanners are mostly working short time, and the production is being lessened. There has been an increased demand for paper. Material remains at about the same price. The supply of cattle has been good, and sometimes in excess of the demand. On such occasions the regulations preventing the removal of cattle out of the borough have caused forced sales. Number shown (four markets)—Beasts, 1,445; sheep, 11,400. There has been a fair supply of both new and old wheat; the new wheat generally in bad condition, and difficult to dispose of. Prices have advanced considerably.

The Trade in Rags.—Foreign rags, for the use of the paper maker, are now imported into Great Britain from almost every country; they come hither even from Japan and the most remote states of South America, but the Continent of Europe is the chief source of supply. The bags containing them are not opened in the docks, and very rarely in the rag merchant's warehouses, but transmitted in the condition in which they have been imported to those who purchase them for the purposes of their manufactures. Home rags also, for the most part, pass through the hands of the wholesale rag merchants, who are chiefly congregated in London, Liverpool, Manchester, and Bristol; but before reaching them they pass through various other hands, the marine-store dealers and the collectors of household rags sorting them more or less before selling them. The rag merchants, however, have to re-sort some. Generally, there is no process adopted by the trade for cleansing or disinfecting rags up to the moment at which they leave the rag merchant, beyond such as may be involved in the sorting they undergo. Rags collected in country districts are, as a rule, cleaner than those collected in towns. Irish rags are generally very filthy, and many foreign rags (such as Italian, Spanish, Russian, and especially Egyptian) are often not only dirty, but most offensive in smell. In 1863 we imported 25,288 tons of foreign linen and cotton rags; in 1864, 23,732 tons; last year, 18,263 tons; and in the six months ending June this year, 8,842 tons. Such rags as are useless for any other purpose are employed as manure in hop grounds. With this exception, all woollen rags (and 22,000,000 pounds are annually imported) are converted into shoddy; and articles consisting of a mixture of cotton and wool (called "Challies") are now made available by removing the cotton by means of sulphuric acid. The cotton and linen rags go to the paper mills, which also turn to account many other materials, such as old paper, pawnbrokers' tickets, and the minute discs which are punched from postage stamp sheets, not to speak of straw and some 50,000 or 60,000 tons of esparto grass. There are supposed to be in the United Kingdom 370 or 380 paper mills; the quantity of paper made weekly at each varies from one or two to 70 or 80 tons, the amount of rags used being about 5 per cent. in excess of the paper manufactured. The number of hands employed at a mill ranges from four or five to seven hundred. One of the first processes to which the rags are subjected at the mills is that of dusting, by which is removed not only the extraneous dust, but much of the animal filth which has become incorporated with them while in use. In some of the larger mills this is the first process, and is done by beating by machinery. The rags are thus, before being placed in the hands of the rag-cutters, deprived of much of that which is likely to be offensive in them; and the rag-cutting room, which is always a dusty and not agreeable place, is rendered much more cleanly and sweet than it would otherwise be. But in many mills the dusting is not effected until after the rags have been cut and sorted. There is a single mill (Mr. Joynson's) in which from 250 to 350 rag-cutters are employed. On inquiry among the work-people in London, at the rag merchants' warehouses and the marine-store dealers, Dr. J. S. Bristowe, medical officer to the Privy Council, failed to obtain any evidence that infectious diseases have been brought to them through the agency of rags, or that any fever has prevailed among them.

The American Trade in Indian Corn.—The superabundant production of this cereal in the Western States, and the variety of uses to which it is put, makes it, next to wheat, the most important crop in the economy of production. The rapid settlement of the Western States, from the tide of emigration from the eastern and middle States, and Europe, has unprecedentedly increased this crop; and the production has more than doubled even in the last eight or ten years. The whole crop of the United States in 1840 was 379,000,000 bushels, and in 1860, 830,500,000 bushels. But the North-Western States are the great maize producers, having raised 156,500,000 bushels in 1840, 476,500,000 in 1860, and 704,500,000 in 1865. The production of this cereal has an important effect upon the American revenue and nearly all the great industrial revenues of the country. It enters largely into the manufacture of distilled spirits, pork, beef, starch, syrup, and is all important to the external com-

merce and railway transportation. In the more isolated portions of the West it is used on the cob very extensively for fuel, being more economical than wood or coal in those sections where the latter articles are not plentiful. The foreign demand has attained a very considerable magnitude. Companies have been formed in New York, Montreal, and in several places in the West for the manufacture of sugar and syrup from corn, by a chemical process, discovered by Professor Gesling, a scientific German, of Buffalo. It is said that three gallons of fine quality syrup can be obtained from 36 lbs. of corn, and that the refuse, after obtaining the starch from it, is worth, for cattle food, 10d. This crop under a more widely-spread cultivation, will soon, in America, be 2,000,000,000 of bushels annually, with a domestic consumptive demand approximating to the increased supply. The imports into Great Britain from all countries vary from 6,000,000 to 12,000,000 cwts. annually. This is obtained from the southern ports of Russia, Austria, and Turkey. The American export varies with the crops and the ability to compete with the Mediterranean countries.

Preserved Meats.—A recent report to the Foreign-office, by Mr. F. C. Ford, dated Buenos Ayres, June 26, gave a description of four different processes pursued by various persons for the purpose of preserving the meat available in enormous quantities from the slaughter of cattle in the River Plate for transportation to Europe, and consumption in our markets. During the last two years attention has been specially directed to this subject, and with results which seem at all events to indicate that the problem will ultimately be solved. The first process described by Mr. Ford is the old one for the manufacture of the salted beef known as *charqui*, and which, although its appearance to Europeans is absolutely offensive, is a staple article of food among the negroes of Brazil and Cuba, whither 70,000,000lbs. weight is annually exported. Some experienced persons in the trade are still disposed to believe it might, if shipped with care, come into use as an acceptable food here for the poorer classes, but few who are conversant with English habits will be likely to share that view. At the same time, the extraordinary prospects that would be opened up if methods could be found to present the River Plate meat, after a transit of 6,000 miles across the Atlantic, in a palatable and healthy form, has stimulated persons of scientific reputation to make experiments. Mr. Morgan, Professor of Anatomy in the Dublin College of Surgeons, has introduced a system of forced infiltration of brine into all the tissues of the animal immediately after death,* and this is said to be simple, and to demand little labour and no expensive machinery. Within the past sixteen months about 500,000 lbs. of beef and mutton prepared in that manner have been shipped from Montevideo to Liverpool, and met a ready sale at 4d. per pound; and although that price would be barely remunerative under present circumstances, "it is believed that it will leave a fair profit when once the working is established." The beef is said to bear a strong resemblance to English corn beef. A company at Liverpool, called the Morgan Patent Meat Preserving Company, have bought the patent, and works have been established near Paysandu, on the Uruguay, in the Oriental Republic. The next process described is that of Baron Liebig, and consists in reducing the meat to an essence, at the rate of 1 lb. of essence to 36 lbs. of meat, so that eight small tins will hold the concentrated alimentary matter of an entire ox, and 1 lb. of the essence is sufficient to make broth for 128 men. But this preparation is suitable only for soup or stock, and the cost of 1 lb. is 12s. 6d. The smallness of its bulk, and its purity and entire freedom from grease, particularly adapt it to the use of hospitals and invalids; and in Germany, whither the principal consignments have been hitherto made, the consumption has been very great. In London, also, there is an increasing demand. The establishment for the manufacture is at a place called Fray-Bentos, also on the Uruguay. The last process mentioned by Mr. Ford is one called Sloper's process. This patent professes to enable meat to be preserved in its fresh and raw state for transportation to England, and to arrive in the exact condition of butchers' meat just killed, and to be sold at 4d. to 5d. per pound. The meat is packed in tins, and preserved by the introduction of "a certain gas, the composition of which is kept a profound secret." In April last a trial of some samples was made at Buenos Ayres, in the presence of the Vice-President of the Argentine Republic and other public functionaries, and the result was declared to be perfectly satisfactory. A consignment of 10,000 or 12,000 pounds of beef was to be despatched in July to England, and some specimens are understood to have just reached London. Meanwhile, another very ingenious invention has also been patented. This is by Dr. Redwood, Professor of Chemistry to the Pharmaceutical Society of London, and consists in the immersion of fresh meat in melted paraffin at a temperature of 240 degs. Fahr. This preparation preserves all the nutritive qualities of the meat, and has likewise the advantage of rendering tin cases or any other expensive mode of packing unnecessary. The paraffin forms a coating which is entirely free from any unpleasant appearance, and which is removed by the immersion of the meat in hot water. One great objection, however, seems likely to prevail. The meat thus preserved, although agreeable to the taste, will not bear fresh cooking. It is fully cooked by the process itself, and can, therefore, it is apprehended, be used only in its existing cold state, in which, for army, navy, or other stores or travelling purposes, it may, probably prove of much value.

* For a description of this, see Paper by Mr. Morgan, read before the Society in April, 1864.—*Journal*, Vol. XII., p. 348.

Colonies.

New South Wales.—The prospects of this colony are brighter now than they have been for some time. After three or four years of half-harvest, or none at all, there is now every prospect of a bountiful crop. More land is under tillage than before, and the season is now all that can be desired. There has been an abundance of rain, and from all quarters it is stated that the young crops look healthy. The pastoral prospects are good. The rain came in time to provide grass against the lambing season, and the weather having been warm for the first time after the rain gave the young grass time to grow. There has not, therefore, been the mortality there might have been had winter set in earlier, or with more severity. Feed is now abundant, and there is every prospect of the yearly increase being up to the usual average. The price of wool, too, is very encouraging to the sheep farmers. The total revenue for the quarter ending the 30th June amounted to £476,736 15s. 7d.; the corresponding period of 1865 was £372,383 18s. 9d., showing an increase of £104,352 16s. 10d., which, added to the increase of the preceding three months, makes a total increase of £233,533 15s. 11d. The following are the amounts of revenue under each head for the years ended 30th June, 1865, and 30th June, 1866:—

	1865.	1866.
Customs	£573,433	£756,10[illegible]
Gold	31,886	29,115
Mint	26,391	21,186
Land	314,361	597,4[illegible]
Post Office	69,653	77,1[illegible]
Telegraphs	30,972	32,975
Railways	163,106	167,[illegible]
Stamps	4,236	67,[illegible]
Sundries	240,971	—
	£1,462,009	£1,[illegible]

EMIGRATION.—According to the official returns for the emigration to Australia and New Zealand during the year 1865 the number of persons were distributed as follows:—

To New South Wales	2,623
„ Queensland	12,551
„ Victoria	9,713
„ South Australia	5,145
„ West Australia	174
„ Tasmania	40
„ New Zealand	7,037
Total	37,283

This shows a decrease, as compared with 1864, of 3,659, but an increase over that of 1861 of 13,545. The principal decrease last year was in the emigration to Victoria.

QUEENSLAND.—The colonists of Rockhampton and other northern ports are agitating for separation from Queensland, and the erection of those districts into an independent colony. They are very unanimous and enthusiastic in favour of the project.

SYDNEY HARBOUR.—It appears that the colonial government have placed £24,600 on the estimates for the construction of a new dredge, as the rapid shoaling of Sydney Harbour, caused by the sewage of the city being discharged into it, without any provision being made for intercepting the silt washed down from the streets, and brought down by the sewers, is becoming an alarming impediment. The harbour has been sustaining for years past this accumulation of filth, rendering it at length absolutely necessary to employ a steam dredge to maintain the proper depth of water. Several surveys have recently been made under the Harbour Commission, which show that very large and serious encroachments have been made on the water of the harbour by the silt and other refuse washed from the city. Wooloomooloo Bay, in front of the wharf, has been greatly deepened, a very large quantity of silt having been taken up and deposited to raise the ground behind the wharf. The streets of the reclaimed lands of this bay have been filled in and brought to their proper level.

TASMANIAN REVENUE.—The total revenue for the past half-year of 1866, at Hobart-town was £33,678 11s. 6d., and the port of Launceston, £30,478 3s. 5d.; total £64,666, showing an increase of £738 as compared with the same period last year. The land revenue for the quarter ended June 30th, 1866, was £26,419 19s. 3d., against ,947 17s. for the same period of 1865. The total revenue for 1865 was—Customs, £118,775; inland, 3,434; land, £71,343, making a total of £233,552, against £266,602 in 1864, £250,657 in 1863, and 55,780 in 1861.

QUEENSLAND COTTON.—Some experiments in cotton growing have been tried by some settlers on the north bank of the Brisbane. The proprietors planted last season, to test the relative valve of the two crops on equal quantities of land of the same description, in maize and cotton, ten acres on each. Both crops turned out remarkably well. The maize averaged 70 bushels, and realised £17 per acre. The cotton yielded 650 lbs. of cleaned New Orleans, giving a return of £50 per acre. In consequence of this result, 30 acres was planted for cotton in the present season, and the picking is now in progress, with every prospect of a very large crop.

COLONIAL KEROSENE OIL.—On the subject of the Hartley coal oil the *Sydney Morning Herald* says:—"The richest cannel coal yet discovered in Australia is being transmuted into oil. Some of the first produce of the works of the Hartley Company has been received in town, and its quality is in every respect satisfactory. The crude oil is produced from the coal by a process of retorting. At present only nine retorts are set up; they are producing at the rate of 1,200 gallons per week, but they are not worked up to their full capacity, and can be made to produce 2,000 gallons per week. The Hartley oil does not catch fire till it is heated to a temperature of 147 deg. This is important in a country like this, where in the heat of summer the thermometer often ranges above 100 deg. The consumption of kerosene in these colonies must probably amount to two million gallons per annum, and the rate of consumption is steadily on the increase, even leaving out of account any probable demand for steam purposes. There is, therefore, a large local market, irrespective of any trade that may be done by exporting."

Publications Issued.

JOURNAL DE L'AGRICULTURE.—(*Ch. Delagrave and Cie*, Paris.)—The attention now directed towards agriculture in France, is indicated by the increase of the number of publications relating to this important science and industry. The work of which the title is given above is under the direction of M. J. A. Barral, the editor of a well-known periodical, *La Presse Scientifique et Industrielle*, who is assisted by a large number of writers of established reputation. The concluding part of the first volume is now ready, making a large octavo volume of nearly five hundred pages. The work is published twice in the month, and the price is exceedingly moderate. It contains a large amount of information relative to the condition of the crops, meteorology, cattle, agricultural implements, new plants, improved methods of cultivation, distillation, wine-making, cheese-making, and other rural industries, and is illustrated by many wood-cuts; with elaborate tables of prices current in the various parts of France as well as in other countries; lists of works relating to agriculture, and much valuable miscellaneous information, including comparative notes relative to the condition of agricultural matters in England and other countries; presenting altogether a valuable compendium for scientific and practical agriculturists. The journal has the support of many of the central and local societies for the encouragement of agriculture, so that it may be said to be, to a certain extent, official as well as critical, while M. Barral's reputation as a populariser of science is a guarantee for the maintenance of the useful character of the new journal.

Notes.

PARIS MARKETS.—The Marché Beaujon is situated in the Rue de Lisbonne, near the Rue Miromesnil and the Bouvelards Haussmann and Malesherbes. This market, of large size, and constructed on irreproachable conditions of ventilation and internal arrangements, contains 300 stalls. It replaces the market known first under the name of Marché Percier, afterwards Marché de Laborde, at present abolished, and which was held twice a week close to the Eglise St. Augustin. The new market, which is held daily, will supply the whole of the population from the Faubourg du Roule to the Rue d'Amsterdam, and will be a boon to these quarters—up to the present time without a central means of supply of provisions—and will now enable them to obtain their household provisions with competition both in price and quality. This new market is the first large market opened to the public by the Compagnie Générale des Marchés; they have still ten more to construct or finish. Towards the 15th October they will open the Marché Brézin, at Montrouge; the 15th November, that called St. Quentin, on the Bouvelard Magenta; about the 15th January the Marché des Batignolles, and soon after one on the Place d'Italie. Auteuil and the Porte Dauphine (Passy) will have their markets completed about May; and in the course of the year 1867 the Marchés de Montmartre, les Villette, Belleville, Vaugard, will be

opened to business. These great works of public utility are connected with the most important and necessary improvements of the capital.

Spanish Railways.—The line of railway crossing the passes of Sierra Morena is now open for traffic; thus the journey may be made without interruption between Paris, Madrid, Cordova, Seville, and Cadiz. Within a few months Madrid will be united with Lisbon by the Badajos railway.

French Pharmacopœia.—The last issue of the French Pharmacopœia appeared in 1837; a new edition has just been prepared, the result of the labours of an Imperial Commission during the last three years. In addition to the changes rendered necessary by the progress of science, the formulæ have been drawn up as far as possible in accordance with those of neighbouring countries, and an appendix has been added, containing foreign formulæ of recognised value. The new edition is therefore regarded by its authors as the first approach towards that grand desideratum, a univeral pharmacopœia. In this age of rapid travelling, says the commission, chemists may be called upon to make up the prescriptions of medical men residing at great distances, and, therefore, local pharmacopœias have had their day; nothing but one recognised by all the scientific world is worthy of the time; but, in order to produce such a work the concurrence of various governments is as necessary as for the generalization of money, weights, and measures. In the meantime France takes the first step on the road, and it is hoped that her endeavours will not be repulsed, and that the world will be endowed with another element of public health and security; it is hoped amongst other things that other nations will not persist in their special doses in the case of medicines containing active and dangerous poisons, such diversity in practice creating unnecessary perils for invalids, a preparation, bearing the same name, being in one place too weak and ineffective, and in another too strong and dangerous. It would undoubtedly be highly advantageous if the formulæ of all pharmacopæias could be made to agree, but there are many serious difficulties in the way, such as climate, constitution, diet, to say nothing of habit; nevertheless, every attempt to generalise medical science deserves, and will doubtless receive from all enlightened men, cordial approval and co-operation.

The Foundations of the Old Louvre.—Excavations have recently been made in the court of the old Louvre, with the view to the discovery of the real position of the older Louvre, that of Philippe Auguste, and the search has been crowned with success by the uncovering of the foundation walls of the whole of the five towers of the former building. These ancient works are very solid, and are now in part open to the view of all the world.

An Extensive Farm in Brazil.—One of the most extensive farms in the world is that of the General Urquiza, of Buenos Ayres. It is about 300 square leagues in extent, on which there are grazing almost incalculable numbers of horses, beasts, and sheep. This farm sends 50,000 head of cattle annually to be slaughtered. The horses would be sufficient to mount the cavalry of a large army, and a good many ships are annually laden with the wool of the sheep, for Europe.

Patents.

From Commissioners of Patents' Journal, September 28th.

Grants of Provisional Protection.

Actinic power of light, determining the—2355—L. Bing.
Architectural mouldings, composition for—2320—C. Bathoe.
Beer and ale—2298—J. Schneider.
Bookbinding—2211—L. Delagarde.
Boot legs—2321—C. F. de Gaudel.
Boots and shoes—2310—C. F. Allbon.
Buttons or studs—1945—I. Hayem, jun.
Calcareous bricks—2323—W. E. Gedge.
Carriages—2342—J. Williams.
Cornices—2162—T. W. H. Newbold.
Electric telegraph conductors—2329—J. H. Johnson.
Fabrics—2351—W. Clark.
Fabrics, cross raising the pile of—2297—J. and J. W. Asquith.
Fire-arms, breech-loading, and cartridges—2304—C. E. Brooman.
Fire-arms, breech-loading, &c.—2326—E. Harlow.
Float light—2301—C. Defries.
Furniture—2343—J. P. Bright.
Gun carriages—2328—R. A. E. Scott.
Gun carriages—2938—R. A. E. Scott.
Guns—2337—R. A. E. Scott.
Hoops, uniting the ends of—2345—S. Woodall and J. M. V. Wiath.
Hydraulic gas chandeliers—2357—G. Henderson and D. McNeil.
Indicators—2340—W. E. Gedge.
Ink-supplying penholders—2309—A. F. Chapple.
Irons, handles of—2313—J. Silvester.
Lace—2290—W. Selby.
Leather—2316—W. Clark.
Leather straps—2344—M. J. Haines.
Leather straps, &c.—2336—W. E. Gedge.
Lights in theatres, lighting—2318—W. Vincent and G. R. Weston.
Liquids, measuring—2333—R. A. Hardcastle.
Liquids, separating matters from—2331—W. Olley.
Marine steam boilers—2339—G. T. Bousfield.
Metallic mirrors—2018—J. W. Hoffman and G. R. Wilson.
Motive power—2330—R. Bennett.
Oil-cup—2312—C. E. Brooman.
Pianofortes—2335—T. C. Lewis.
Rags, &c., cutting—2947—E. H. Aydon and E. Pocock.
Railway break—2302—J. and W. Kitchen, and S. Samuels.
Railways, working switches and signals of—2185—W. L. Owen.
Railway trains, signalling on—2295—A. H. Hart.
Reaping machines—2314—C. T. Burgess.
Roller skates—2305—W. F. B. Klein.
Sanitary purposes, apparatus for—2346—T. Wheelhouse.
Seamless metallic tubes—2319—A. V. Newton.
Ships—2294—T. Berney.
Steam boilers—2332—T. Baldwin.
Steam engines, lubricating—2317—W. Frankland.
Steam engines, slide valves for—2296—C. D. Abel.
Steam vessels, steering—2327—W. J. Curtis.
Steam whistles—2288—W. Cuthbert.
Structures, connecting parts of—2334—F. A. Paget.
Studs, &c.—2322—W. E. Gedge.
Thrashing machines—2948—J. Davey.
Timber, sawing—2300—J. Lochhead.
Type, composing—2303—A. Mackie.
Water-closets—2315—F. Warner, W. Stewart, and G. W. Barber.
Water-power engines—2306—E. T. Hughes.
Weaving, looms for—2292—J. Bullough.
Weaving, looms for—2308—C. Catlow.
Weighing machines and indicators—2311—C. Hodgson & J. W. Steel.

Inventions with Complete Specifications Filed.

Steam pumps—2469—W. R. Lake.
Steel—2415—A. B. Berard.

Patents Sealed.

916. G. Sturrock.	972. G. Rumbelow.
924. W. Pendry.	1130. W. E. Newton.
933. W. B. and E. J. Collis.	1139. M. Spiquel & E. H. Fleurp.
934. E. P. H. Vaughan.	1140. M. Spiquel & E. H. Fleurp.
943. M. P. E. Vors.	1148. C. D. Abel.
946. J. M. Bowan & A. Morton.	1290. J. Hartshorn.
947. C. F. Carlier.	1832. W. Clark.
952. J. Robey.	1868. G. Plant.
966. S. M. Martin & S. A. Varley.	

From Commissioners of Patents' Journal, October 2nd.

Patents on which the Stamp Duty of £50 has been Paid.

2380. J. T. and E. Harlow.	2425. E. B. Wilson.
2410. T. Horsley.	2661. J. Marshall.
2477. G. Parry.	2385. F. Preston.
2382. J. H. Johnson.	2401. J. Mackay.

Patent on which the Stamp Duty of £100 has been Paid.

2218. W. H. Buckland.

Registered Designs.

An Improved Glove—September 5—4809—Bowen and Sons, Chipping Norton, Oxfordshire.
Self-acting Vent Peg—September 11—4810—T. Lewis, Cardiff.
Gas Burner—September 18—4111—A. F. W. ter Meu, Haarlem, Holland.
A Radiating Ash Pan—September 20—4812—W. Marshall, 57, Oxford-street, Manchester.
A Curved Roller Blind—September 20—4813—R. Lindesevig and W. Jolly, Islington.
Hat and Coat Rail or Portable Wardrobe—September 22—4814—T. Tonks and Sons, Birmingham.

Journal of the Society of Arts.

FRIDAY, OCTOBER 12, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade*, obtain the highest number of marks, with a certificate, in those subjects respectively.

Musical Education Committee.

The Musical Committee resumed its sittings on Wednesday last, and took into consideration the instruction of the Council that the Committee should seek the co-operation of such persons and bodies as may be disposed to aid them in promoting the objects expressed in their two reports already published in the *Journal* (see pp. 565 and 613). The Committee determined, in the first instance, to address themselves to the Members of the Society, and they have directed the Secretary to receive the names of such members as are desirous of co-operating in this important national movement.

It was announced that the Royal Academy of Music, having applied for new premises at Kensington, the Lord President of the Council, the Duke of Buckingham, had requested the Earl of Derby, as President of the Commissioners of the Exhibition of 1851, Earl Granville, as Chairman of the Finance Committee, and the Earl of Wilton, as Chairman of the Directors of the Royal Academy of Music, to act as a Committee for considering this application, and that they had consented to do so.

Proceedings of the Society.

CANTOR LECTURES.

"On the Synthesis and Production of Organic Substances and the Application which some of them Receive in Manufactures." By Dr. F. Crace Calvert, F.R.S., F.C.S., &c.

Lecture II.

Delivered on Friday, April 20th.

On the Transformation of Neutral Substances.

The object in this evening's discourse is to invite you examine with me the valuable, varied, and curious transformations which one substance is capable of undergoing, and which have been brought out through the study of its chemical nature and composition; and what, I hope, will render these transformations especially attractive is the fact, that they have reference to the reproduction of substances which are either found abundantly in nature, or which have received numerous and useful applications in arts and manufactures. The substance which I refer to is Starch, a white, granulated substance, insoluble in water, which undergoes no change or decay, if kept dry, even for centuries, but which, when damp or brought into contact with water, rapidly undergoes decay. Starch, when boiled for a few minutes with 8 or 10 parts of water, and the whole allowed to cool, forms a jelly, which gives a magnificent blue colour with iodine. This colour has been the subject of much study by chemists, owing to the fact that it disappears when heat is applied to it, and that it reappears as the liquor cools. It is so brilliant that many attempts have been made to apply it in some form or other in arts and manufactures; and in some of my previous lectures I have described some of them. Starch, as you are aware, is most abundantly found in nature, especially in the grains of cereals, such as wheat, barley, oats, &c.; it exists also in large quantities in bulbs, such as potatoes; and in leaves, fruit, stems, and roots. It is easy to conceive that such a substance should have been devised by the Creator, first to preserve and then to feed the young germs contained in seeds, for, as I have just stated, it is unalterable by time if kept in a dry condition, whilst it undergoes the most rapid transformations if placed under certain circumstances, or if it comes in contact with certain chemical agents. Of this we shall have, as we proceed, most interesting instances, especially when we examine the transformations which starch undergoes during the germination of seeds and in the ripening of fruits; but to enable you to understand thoroughly these transformations, allow me to call your attention to some of the transformations which starch undergoes by purely chemical action, and then we shall apply them with better success to the chemical changes which take place in nature under vital action.

When starch is mixed with hot water, and a few thousandths of an acid, especially vitriol, are added, the globules of the starch are swollen; they burst; and the more soluble portions of the amylaceous matter are transformed into what is called soluble starch, the liquor losing its opaque appearance and becoming transparent. I may mention that it is a similar transformation that renders the Glenfield Patent Starch so much appreciated for stiffening net and other similar fabrics, owing to the circumstance that they are stiffened without becoming opaque. Let us now proceed to examine what takes place if the proportion of acid is slightly increased, and the heat continued for a short time; we shall find that the starch is susceptible of undergoing a further molecular change, the liquor assuming a slight yellow tinge, and instead of giving with iodine a bright blue colour it yields a rich crimson, the starch having become converted into what chemists called dextrin. This transformation is purely molecular; nothing is added to or subtracted from the original elements of the starch. But if, instead of stopping the operation at this point, we still continue to boil for, say three or four hours, we shall find that the liquor will gradually cease to yield a colour with iodine, and when it has entirely ceased to do so, if we neutralize the slight acidity of the liquor by adding to it a little chalk, and by filtration remove the gypsum deposit, we shall observe that the liquor has a decided sweet taste, and that we have transformed the starch into glucose, or what is often called grape sugar, because it is found in grapes—fruit sugar, because it is found in most fruits—diabetes sugar, because it is found in diabetes. This interesting transformation of starch into sugar is carried on on the Continent on a most extensive scale, thousands

of tons of glucose being manufactured annually, which are used by brewers as a means of producing a cheap and frothy beer; and allow me to add, "under the rose," that it is also employed—and that not with advantage to the consumer—to adulterate honey. In England glucose is not manufactured, in consequence of the restrictions imposed on it by government and the excise laws, but I must not forget to state that when the transformation of starch into glucose is effected on a commercial scale, the apparatus employed is such as to enable the manufacturer to use a slight pressure, experience having demonstrated that this transformation is much more rapid under the influence of a slight increase of pressure, and therefore the manufacturer avails himself of it. You will remember, no doubt, that in several of my previous lectures I have drawn your attention to the fact, that many chemical transformations are brought about or facilitated by an increase of pressure, easily obtained when the mass acted upon is confined in vessels so constructed as to prevent the vapours from escaping.

The transformation of starch into dextrin is also effected by other means. Thus if it is submitted to the action of a heat of about 400° it undergoes the same isomeric change and is converted into dextrin; this transformation is most important, and is carried on, on a most extensive scale, in Lancashire and the north of England, a cheap substitute for gum Arabic being thus placed in the hands of calico printers to thicken their colours, and to enable the workman to apply them on the surface of fabrics, either by means of rollers or engraved blocks. As the orange yellow colour assumed by wheaten starch and potato farina under the influence of heat is often objectionable in a practical point of view, manufacturers mix the wheaten starch or the farina, with a small quantity of acid, and after having dried the whole, submit the mass to a comparatively low temperature, when the transformation of insoluble starch is effected, and soluble dextrin, nearly colourless, or patent gums, as they are called, are produced. For more technical details I must refer you to a paper which I had the honour of reading on the subject a few years since before this Society.*

It is scarcely necessary that I should state that starch is converted into dextrin and then into sugar under the influence of peculiar ferments. You will, I am sure, remember that I explained these transformations when speaking of the action of the saliva, and also that of the pancreatic glands in my lectures on animal physiology last year. You are also, I know, perfectly aware that it is a similar transformation which takes place in the brewer's vat under the influence of the albuminous ferment called diastase, when malt is converted into the saccharine fluid which is called "wash," and which is ultimately converted, by boiling with hops and fermentation, into that national fluid called beer or ale. With these facts before us we can not only appreciate the value of starch in seeds, plants, and fruits, but follow with interest the changes which it undergoes in order to become useful in the germination of the young plant, or in the ripening and sweetening of fruits. Most seeds, indeed I may say, all seeds, contain essentially two elements, one called starch, and the other albumen, a substance, as you are aware, which in the animal kingdom characterises the white of egg and the serum of blood. When a seed is placed in moist soil, and a gentle heat surrounds the whole, the albumen undergoes a molecular modification, and becomes a ferment, which differs from common albumen by the fact that it requires a much higher temperature to coagulate it. Under the influence of this ferment and the joint action of heat and the moisture which surrounds the seed, the starch is converted first into dextrin, and then into sugar, or, in other words, into such substances as are soluble, susceptible of being absorbed, fixed, and transformed into such elements as will constitute the tissues of the young plant. I shall have the pleasure of showing you, as we proceed with this lecture, that when one chemical equivalent of starch has fixed two equivalents of water, and has thus been converted into sugar, it can unfold itself with great facility into either three equivalents of acetic acid or two equivalents of lactic acid, as shown by the following table:—

Sugar	C^{12}	H^{12}	O^{12}
Acetic acid, 3 equivalents	C^{4}	H^{4}	O^{4}
Lactic acid, 2 equivalents	C^{6}	H^{6}	O^{6}

These acids or similar ones dissolve the lime and other mineral matters surrounding the seed, thus carrying to the young germ those mineral elements which it required to become a young plant, which, when once it has grown out of the seed and of the soil which surrounds it, puts forth leaves, which are susceptible of absorbing the carbonic acid of the atmosphere, thus fixing its carbon, which constitutes the framework of the young plants. This carbon, united with the elements of water and nitrogen, gives rise to all the vegetable substances necessary to constitute the vegetable matter of full grown plants.

The ripening and the sweetness of fruits are due to the conversion of starch into sugar, but although this conversion is effected by the presence of acids in the fruit, still they are not exactly the same as those which exist in the young seed, and therefore this peculiar transformation of starch into sugar in fruits deserves our special notice. The predominant acid in green fruit is called malic acid, which partly disappears as the fruit proceeds towards its maturation, whilst the greater part unites with the sugar it has helped to produce.

In fruits and in bulbs there exists another substance which presents to us a peculiar interest. It is a white, gelatinous mass, insoluble in water, and is called pectose. It is also accompanied in fruits and bulbs by its ferment, called pectase, the same as starch is accompanied by its ferment, called diastase. As time proceeds, the pectase acts upon the pectose, and converts the insoluble substance pectose into the soluble substance called pectine, which is a neutral substance, but which in its turn is converted into an acid called pectic acid. This acid, in connection with malic acid, sometimes converts the starch contained in fruit into sucrose, or cane sugar, fructose, or fruit sugar, which I may here state differs from cane sugar in not crystallising with the same freedom, is not so sweet, and also contains two chemical equivalents more of water. The transformations of pectose into pectine and pectic acid are isomeric changes, and therefore are most easily effected in nature. The following table will clearly demonstrate the truth of this assertion:—

Pectose	C^{64}	H^{40}	O^{56},	8 HO
Pectine	C^{64}	H^{40}	O^{56},	8 HO
Pectic acid............	C^{64}	H^{40}	O^{56},	4 HO
Metapectic acid	C^{64}	H^{40}	O^{56},	16 HO

It may be interesting to some of my hearers to know what changes take place when fruits are converted into jelly or marmalades; and whilst on this subject I may state that there is no doubt that a part of what is sold as Scotch marmalade is made from carrot juice, sweetened with a little sugar, and rendered bitter with peel of the bitter Seville oranges. I have the pleasure to present to you some marmalade and jellies that have been made from carrots, and which, from their quality, leave no doubt that, with a little skill and practice, a very agreeable condiment can thus be produced. But setting this aside, let me state that when fruits are heated, the pectase converts the pectose of the fruits into pectine, and if then sugar is added and the whole filtered, the pectine solution, as it cools, becomes gelatinous, and constitutes the ordinary fruit jellies; but ladies or cooks must take great care not to boil these too long, or they will get into a chemical difficulty, for, under the influence of heat,

* See *Journal*, Vol. VIII., p. 87.

ectine will first be converted into pectic acid, and then nto metapectic acid, when no jelly will be produced. Therefore, great care must be taken not to boil the ruit syrup with the sugar more than a few minutes efore it is clarified with a little albumen, or white of gg, filtered, and allowed to cool.

Having thus studied some of the interesting conversions of starch into sugar, under the influence of rtificial and natural chemical influences, let us xamine together the transformations which sugar s capable of undergoing under various chemical nd molecular actions; and this cannot fail to nterest you, as man has availed himself of these ransformations to obtain some of the most abundant nd valuable products which he employs, either or his health or as a beverage. It is especially he transformation of sugar into alcohol on the one and, and the conversion of alcohol into various products; and on the other hand, the transformation of sugar into mannite, the sugar of manna, or its onversion into lactic acid and butyric acid, that I wish o dwell upon for a few minutes. Several of the conversions of sugar into other substances are effected nder the peculiar action of certain ferments, which erments are microscopic plants or animals.

Having already explained the conversion of sugar into alcohol by means of a ferment, and the further transformation of that alcohol into acetic acid by nother ferment—the one called *mycoderma vini* and he other *mycoderma aceti*, — it would be loss of ime to enter again into the subject here; but there s one fact which has come to light since then, and which appears to me sufficiently interesting to justify ny calling your attention to it. I stated last year hat many of the diseases to which wine is subject were not due, as was believed, by chemists and others, o mere chemical transformations of the various substances constituting that liquid, but to peculiar and well defined ferments which develope themselves in hat fluid under special circumstances, and which are the cause and the source of various classes of disease to which wines are liable. The knowledge of these facts has proved most valuable, for it has enabled M. Pasteur to devise a very simple method for arresting the decomposition or decay of wines. M. Pasteur's plan consists in heating diseased wine to a temperature of about 130°, when the ferments are destroyed, and all that is necessary to restore the wine to its original state, is to allow the dead ferments to settle as a deposit, and then to decant the wine.

I may state here, *en passant*, that a M. Lamotte has proposed and carried out with success a method of "ageing" wine rapidly. It consists in submitting the wine for a few days to a temperature of about 100°, when it will be found that after allowing the wine to stand for a short time, it has acquired the flavour of a seasoned vintage.

Let me resume the subject of my lecture by stating that the transformation of sugar into mannite is also due to a peculiar ferment, which is a modification of the *mycoderma vini*, for this ferment is produced by boiling in water the ordinary one, and then mixing the so boiled ferment with a saccharine fluid; a very slow fermentation ensues, the saccharine solution becomes viscous, and if then its composition is ascertained it is found to be represented by a gummy, neutral, viscous substance, and a crystallised white matter, called mannite, one of the chief constituents of manna, which is used as a purgative in pharmacy. If instead of introducing into a sugar solution one of the above-mentioned ferments, it is mixed with albumen, or the curd of milk, or several other animal substances, and chalk added, after a short time the mass assumes a thick gelatinous appearance, and if then it is chemically analysed, it will be found that the sugar has unfolded itself into lactic acid, each equivalent of sugar giving rise to two equivalents of this acid, a substance which is found to characterise the acidity of milk, and which also exists in the gastric juice of man and many other animals, also as acid lactate of lime in the muscular flesh of man and of animals, and which, lastly, is also a constant product in the slow fermentation of flour, in warp-sizers' vats, and in curriers' clearing pits. We thus observe the value of a science which is able to trace, to define, and to characterise the production of a substance from its original source, namely, starch, or sugar, into the stomach of man, and to proceed from thence into the manufacturers' operations such as those which we have just mentioned. A science which can so well trace the production of a substance and its influence in the medium in which it is found to exist, and can give, as I have shown in my former lectures, an explanation of the various functions it fulfils in the instances I have cited, must be indeed a science worthy of your attention, and worthy of the encouragement of the members of this Society.

There is still another transformation of sugar, through the medium of a ferment, which is not less curious and instructive than those just referred to. Here the transformation is not due to a vegetable ferment, but has been traced and proved to have its source in animal life. The ferment is represented by a little microscopic straight figure having a vibratory motion, and hence called *vibrio*. These microscopic animals transform sugar into that noisome fluid which characterises rank butter, called butyric acid, and which substance in its turn can be transformed, as I shall tell you in my next lecture, into a compound called butyric ether, sold in large quantities as the fruit essence of pineapple, used extensively for imparting that flavour to sugar drops.

Since I delivered this lecture to the Society of Arts, there has appeared a paper by M. Bechamps, which presents such a peculiar interest that I must be excused if I here introduce it to the notice of the reader. This learned chemist has gone a step further than Ehrenberg, who stated that most of the chalk formations were represented by the remains of microscopic animals, several of which, by the perfection of their fossils, he was able to define and name. But Bechamps has discovered that, besides the remains of antediluvian periods, there exist at the present time large quantities of microscopic animalculæ, which he has named *Microzyma cretæ*; found by him to exist in the centre of large blocks of chalk, taken out at a depth of 200 feet under the surface of the soil by means of a tunnel driven into the sides of a mountain; what enhances the interest of this discovery is that if some of this chalk is placed in a saccharine solution, butyric and lactic fermentation ensue.

Having thus studied the series of molecular and chemical actions, by which starch is transformed into sugar, dextrine, glucose, alcohol, acetic acid, mannite, lactic acid, and butyric acid, let us still pursue the interesting transformations of sugar into one or two more products. Thus, if starch or sugar is mixed with peroxide of manganese and sulphuric acid, and heat is applied, a most violent chemical reaction ensues, and the most important product thus generated through the oxidation of the sugar or starch by the oxygen of the oxide of manganese, liberated by its contact with sulphuric acid, is an acid referred to in my last lecture, namely formic acid, a substance found to characterise ants, the artificial production of which acid I described to you, by methods which have been devised by M. Berthelot. Again, if we take starch or sugar, and act upon it with nitric acid or aquafortis, we shall convert it into a white crystalline substance, oxalic acid, which for many years was entirely extracted from a wild plant called *Oxalis acetocella*, which in fact was the only known source of obtaining a substance so extensively used by the cleaners of straw-bonnets, and in calico-print works, as well as by the careful house-

keeper to remove iron-moulds from linen. At the present day, through the progress of chemistry, a pound of oxalic acid is not dearer than an ounce was formerly, for not only is oxalic acid obtained by the action of nitric acid on sugar, but it is also produced in large quantities at Warrington, in Lancashire, by Messrs. Roberts, Dale, and Co., through the action of a mixture of caustic soda and potash on sawdust, where under the oxidising influence of the alkali incited by heat, the lignin, or fibre of the wood, which has an isomeric composition with that of starch, is oxidised and converted into oxalic acid. It would carry me far beyond the limits of a lecture were I to examine in detail how those substances in their turn can be converted into others, or the numerous classes of substances to which they give rise. I must, therefore, content myself with examining with you generally the subject under consideration, leaving details for the student. It will be easy to conceive what an amount of useful information the student will derive from such a pursuit; and you will see this more clearly if I lift up a corner of the veil, and give you an insight into those treasures of information. Let me, therefore, refer to some of the transformations of alcohol, a substance so well known to all of us by its presence in most of the beverages we take, and also from its extensive employment in arts and manufactures.

The conversion of alcohol into ether, presents one of the most interesting and remarkable instances known in chemistry, of the unfolding of a substance into two others, under the influence of certain molecular forces, known to chemists (but yet badly explained), as actions of contact, or catalytic actions; that is to say, that science has observed several instances where a substance, when placed in the presence of another, under stated circumstances, will undergo special chemical decompositions, quite different from those which it will experience if the other substance is absent. The unfolding of alcohol into ether and water is a remarkable example of this class of molecular actions. Thus, if 70 parts of strong alcohol are carefully mixed with 100 parts of concentrated sulphuric acid or vitriol, and the whole allowed to remain for a few hours in contact, and are placed in a retort, to which heat is applied, so as to raise the temperature to 284°, it will be observed that one molecule of alcohol will split itself into one molecule of ether and one molecule of water. If such a transformation was to stop there, interesting as it is, it would be only similar to many others which I have brought before your notice. But such is not the case; for if in the heated fluid a small continuous stream of strong alcohol is introduced, it will be found that as the alcohol reaches the heated mass it will unfold itself into water and ether, which distil and still keep separate in the condensed part of the apparatus or receiver. Therefore, under the influence of a compound called sulpho-vinic acid, and heated at 284°, the alcohol which is introduced in such a mass is unfolded, as just stated, into two compounds which cannot unite, though they were united before they came in contact with the sulpho-vinic acid, or had experienced the catalytic action of the sulpho-vinic acid or sulphuric acid.

I hope you do not forget that in my last lecture I called your attention to another action of sulphuric acid on alcohol, viz., that if three-parts of sulphuric acid were mixed with one of alcohol, and heat applied, the sulphuric acid, instead of separating one equivalent of water from the alcohol, so as to transform it into water and ether, would in that case remove two molecules of water, retain them, and liberate a gas which we called olefiant or ethylene. If, instead of acting upon alcohol with sulphuric acid, we act upon it with nitric acid or aquafortis, we produce nitric ether, or, what is commonly called spirit of nitre; and if we mix alcohol with acetic acid, or, what is still better, with a mixture of acetate of soda and sulphuric acid, we obtain a most agreeable perfumed substance called acetic ether, which contributes largely to the flavour of wines and spirituous liquors. In fact, a great variety of compound ethers can be produced by bringing alcohol in contact with an acid, and applying heat; or, what is still more effectual, by bringing into play the action of still more powerful acids, such as sulphuric or hydro-chloric, which by their presence help the transformation of alcohol into those compound ethers so much used in medicine as therapeutic agents. Again, if to a mixture of alcohol and sulphuric acid a small quantity of manganese be added, and a gentle heat applied, a new substance is produced, differing entirely in its properties from that which results from the action of sulphuric acid and peroxide of manganese on sugar, for in that case formic acid is produced, whilst in the one now under consideration, the substance called aldehyde is generated, which substance is characterised by the remarkable property it has of reducing the salts of silver, instances of which you have no doubt often remarked in the metallic globes in shop windows, which present a brilliant reflecting surface, due to a silver deposit, resulting, generally speaking, from the reduction of a salt of silver, by means of aldehyde; lastly, this substance, which was two or three years ago a laboratory product, is now manufactured in large quantities, being used extensively for reducing, in conjunction with hypo-sulphite of soda, the splendid red tar colour known under the name of magenta, into that brilliant green which most of you have admired, under the name of *vert lumière*, from the fact that it maintains not only its green colour by artificial light, but that under the influence of that light its intensity is greatly increased.

Proceedings of Institutions.

Metropolitan Association for Promoting the Education of Adults.—On Tuesday evening, the 9th inst., a meeting was held in the great room of the Society of Arts, for the purpose of distributing the prizes gained at the last examination of this association, including the prize given by Her Royal Highness the Princess of Wales. Harry Chester, Esq., a vice-president of the Society of Arts, presided, and there was a numerous assemblage of the friends of the successful candidates. The Chairman, in opening the proceedings, gave a brief explanation of the origin, objects, and practical operations of the association. The examinations instituted by the Society of Arts were confined to persons over 16 years of age. The Metropolitan Association was founded for the purpose of promoting the education of both sexes between the period when boys and girls leave school up to that age, as well as for promoting adult education in elementary subjects. There were two grades of examination, the lower and the higher. The candidates were examined by the examiners appointed by the association, in reading, writing, spelling tested by dictation, arithmetic, Gospel history, English history, geography; and female candidates were also examined in plain needlework, a subject which was regarded by the Committee as of the highest importance. Prizes for excellence in these various subjects were given, as well as for general proficiency. Feeling deeply the lamentable deficiency of religious knowledge, the association had also instituted examinations in this subject, and these were annually held, certificates and prizes being awarded by examiners appointed by the Bishops of London and Winchester, who sign the certificates. It was gratifying to find that the number of candidates for examination was increasing, though so strongly did he (Mr. Chester) feel the shocking deficiency which existed, not only on this subject, but almost every branch of knowledge, that he was individually in favour of a compulsory system of education. People were not allowed by law to ill-use each other, and he could imagine no

worse usage than to allow persons to grow up uneducated. After some further observations the chairman proceeded to distribute the prizes. In presenting the Princess of Wales' Prize, the chairman explained that when the Prince and Princess became the patron and patroness of the Association, her Royal Highness had kindly consented to give a prize for competition among the female candidates, which had this year been awarded to Ellen Louisa Woollard, of the Lambeth Evening Classes, who was the daughter of a carpenter in Lambeth, and who had been in domestic service. He had therefore great pleasure in presenting her, by command of her Royal Highness, with a handsome Bible and two guineas. In consequence of the absence of the Princess from London, she had not been able to attach her signature to the prize; but when her Royal Highness returned to London she would do so. The Rev. G. B. Macilwain, honorary secretary, introduced Mr. Larkins, the new secretary, to the meeting, and he was greeted with hearty applause. On the motion of Mr. Benjamin Shaw, M.A., chairman of the committee, seconded by the Rev. Mr. Bruce, a cordial vote of thanks was given to Mr. Chester, who had, in fact, founded, watched over, and brought the Association to its present position. The Chairman acknowledged the compliment, and after some remarks from Mr. Baker, of the West London Youths' Institute, the proceedings terminated.

PARIS EXHIBITION OF 1867.

The following is from a correspondent at Paris:—

The Imperial Commission has made an alteration in the conditions laid down respecting the time for sending in works of art for the Exhibition, which will give great satisfaction to artists, as well as other possessors of works of art. According to the original regulation, works intended for the great Exhibition were to be sent in for examination by the jury in the month of October; by the terms of the regulation just issued no work will have to be deposited before the month of January. In the first place artists are invited to send to the jury, during the first half of December, a written declaration, containing a description of the works they propose to exhibit, with their dimensions; the jury will examine these declarations, and admit works of known merit, and which they deem suitable for such an exhibition, without having the works themselves before them, which will only be required to be sent in between the 15th and 25th of February; those which are not admitted without previous examination will have to be deposited at the Palais de l'Industrie between the 5th and 20th of January, so that by the new regulations the time during which the works will be out of the possession of their owners is diminished by three months in one case and four months in the other. This revision of its regulations shows that the Imperial Commission is desirous of satisfying the legitimate complaints of the public, and not obstinately determined on maintaining an unpopular regulation.

An incident has just occurred in connection with the Fine Art portion of the Exhibition, which has caused much surprise and many comments. By the regulations of the Commission, one-third of the Fine Art jury was to be named by the Academy of the Beaux Arts, but the members of that branch of the Institute of France have declined to take any part of the work. It will be remembered that the management of the periodical, now annual, exhibitions of modern works of art, as well as the direction of the School of Fine Arts, was taken away from the Academy three years since, by Imperial decree, and the members of the Institute now indicate by this refusal their determination not to accept a part of that power which formerly was all their own. It is impossible not to condemn this act of the Academy; its management of the exhibitions and of the educational establishment gave rise to loud complaints, and it is certain that the changes have been highly beneficial to both, and that the Imperial interference, absolute though it was, was highly acceptable to the majority of artists, as well as of the artistic world in general; and the refusal of the Academy will only strengthen the general opinion that institutions of that class do not partake of the progressive spirit of the age in which we live.

The regulations concerning the conveyance of objects to be exhibited have just been published. Productions of all kinds (objects of art and other valuables excepted), carriages and animals will be conveyed by the railways at one-half the usual charges, the minimum being, however, fixed at four centimes per ton per kilomètre, less than three farthings a ton per mile. The companies are however, in consideration of this reduction, absolved from all responsibility whatever as regards accidents to animals thus conveyed. Works of art and other valuable objects to be charged at the ordinary rates. The diminution of the tariff does not, however, apply to objects weighing more than ten tons, or of dimensions exceeding that of the material of the railway, but locomotives, carriages, and tenders, which can be placed on the rails, are included. Objects weighing less than 1,200 kilogrammes (1¼ ton) will be conveyed by cart from the termini to the Exhibition building, and those which exceed that weight by means of the circular railway which will connect all the termini with the railway station just without the grounds of the Exhibition. All charges to be paid to the Exhibition, but on reception when returning. The reduced tariff to apply to objects returned from the Exhibition within six months of its closing.

INUNDATIONS IN FRANCE.

The waters have happily retired to their proper beds; engineers are everywhere at work repairing the mischief done, and providing, as far as possible, against the effects of another flood, while the unfortunate sufferers are counting their losses, and pressing wants are being met by contributions headed by the Emperor.

The inundations have extended to the departments of the Seine, Seine-et-Marne, Allier, Loiret, Loire, Haute-Loire, Yonne, Côte-d'Or, Lozère, Lot, Savoie, Nièvre, Corrèze, Dordogne, and Lot-et-Garonne. Fortunately, the Rhone and the Gard, although swollen, have not overflown their banks, and the Garonne, which for a moment was swollen to repletion, diminished almost immediately without having caused any serious mischief.

The Seine continued to rise at Melun, the chief town of the Seine-et-Marne, until the evening of the third instant, since which time the level has continued to diminish.

Nantes and its neighbourhood have suffered terribly; on the 2nd instant the Loire had reached to nearly the level of the flood of 1856, and the river was still rising. The railway, as well as the embankments of the river, were broken down between Saint Martin and Saumur, the embankments of the River Divatte were expected to give way, and the slate quarries of Angers to be inundated. The streets in the lower part of the town of Nantes were filled with water, and the country around was under water to the extent of three or four miles. The telegraph poles were thrown down, and for two or three days there were no means of communication with Nantes. The plains around Gien are still under water, the banks of the canals having given way; the road to Châtillon and the railway are both broken up. In the Maine-et-Loire, the banks of the Loire have only given way in two places, namely, at Gohier, on one side, and near Saint Martin de la Place on the other. In the latter case, the railway formed a barrier against the waters, but they soon made a breach to the extent of more than sixty yards in length and seven or eight in depth; beyond this was the embankment for the pro-

tection of the fertile valley of Authion, which skirts the Loire and extends as far as Trelazé; the flood soon made a similar breach in this, and the whole valley was submerged. Trelazé was saved by an embankment constructed after the terrible floods of 1856. At Nevers, the Haute Loire rose, on the 25th and 26th of September, seventy inches in twenty-two hours; at Orleans it rose at the rate of nearly five inches per hour. The lines of the Lyons and Orleans railways have suffered severely; the following is a report made by the former company on the 3rd instant:—"The circulation is re-established, since the morning of the 2nd instant, between Orleans and Vierzon, and a provisional service for passengers has thus been made between Paris and Bordeaux. The line was either broken or under water at Ambroise and St. Pierre des Corps, on the road between Blois and Tours, and gangs of workmen are engaged in repairing the mischief as fast as the waters recede. The station of Tours has escaped, and consequently the service was not interrupted between Mans and Bordeaux. The line between Tours and Nantes was interrupted near Langeais, at Saumur, and near Ancenis, and it is difficult to form an idea at present of the amount of damage done, but the company believe that it will prove to be considerably less than it was in the year 1856." This report gives a vivid notion of the extent of the inundation in the part of the country to which it applies. Nevers, Gien, Montargis, Château-Renard, and Châtillon have all suffered severely.

The rivers Yonne, Lot, Dordogne, and Tarn have all overflowed their banks more or less. Savoie seems to have suffered very severely; besides the destruction of the great high road to Italy, mentioned last week, the Arc overflowed, destroyed the railway in several places, and created other terrible devastations. The railway between Saint Jean and Saint Michel will, it is feared, take a long time to repair. The official *Gazette* of Italy says that, according to reports from the French authorities, the Mount Cenis route was free on the 2nd instant, and the postal route re-established, but with inevitable loss of time, from the necessity of conveying the mails on the backs of mules from Saint Jean to Lanslebourg.

Accounts from Perpignan of the evening of the 2nd inst. say that the Agly has overflowed, and laid the vineyards of Rivesaltes, and part of the plain of Salamanque under water, that the Têt had also broken its limits, and the rain was descending in torrents. It may be remarked that on the Lyons and Orleans line, where the inundations were so terrible the other day, the weather was almost uninterruptedly beautiful, and the skies brilliant; this remark applies to the last few days of September and the first three of October.

Happily the destruction of human life seems to have been but small, but the loss of the farmers and peasants, in cattle, grain, fodder, and growing crops, is enormous; the damage done in the department of the Ardèche is estimated at about thirty thousand pounds, and the mischief there is nothing as compared with that in other districts. Some strange accidents occurred amidst the general desolation. In the neighbourhood of Nemours a whole party were surprised by the waters, and driven to the upper floors of the house, where they were prisoners for thirty hours; and in a meadow in the same neighbourhood which the water had covered but retired from was found, at a great distance from any habitation, a heavy chest of drawers full of linen, for which no owner could be found.

The Emperor has headed a subscription on behalf of the sufferers with the munificent sum of £4,000, to which the Empress has added £1,000, and the Prince Imperial £400; the example thus set has been well followed, and the lists published to the present time, and including the contributions of all classes, from the 20,000 francs subscribed by Baron James de Rothschild to the 50 centimes of the poor couturière, make up a very large amount.

NITRO-GLYCERINE IN THE SANDSTONE QUARRIES OF THE VOSGES, NEAR SAVERNE.

The explosive properties of nitro-glycerine [$C^6 H^5 (NO^4)^3 O^6$], and the results of experiments made with this substance in various parts of Sweden, Germany, and Switzerland, have induced Messrs. Schmidt and Dietsch, proprietors of extensive sandstone quarries in the valley of the Loire (Bas Rhin), to try it in their workings.

These experiments have been successful both as regards economy, facility, and rapidity of work, and the use of powder has been temporarily abandoned, and for the last six weeks only nitro-glycerine has been used for blasting purposes in these quarries.

1. *The preparation of Nitro-Glycerine* is commenced by mixing in a vessel, placed in cold water, fuming nitric acid, at 49° or 50° Baumé (1·476 or 1·490 sp. g. English), with double its weight of the strongest sulphuric acid. (These acids are both expressly manufactured at Dieuse and sent to Saverne.)

The glycerine of commerce, which should be free from lime and lead, is evaporated in a vessel until it indicates 30° to 31° Baumé (1·245 and 1·256 sp. g. English). This concentrated glycerine should become solid when completely cold. A workman then pours 3,300 grammes (about 7¼ lbs.) of the mixture of sulphuric and nitric acids, well cooled, into a glass vessel (a stone pot or porcelain vessel will equally answer the purpose), placed in a trough of cold water, and then pours slowly, while gently stirring it, 500 grammes (1lb. 1oz.) of glycerine. The most important point is to prevent a sensible heating of the mixture, which would cause a rapid oxidation of the glycerine with the production of oxalic acid. It is for this reason that the vessel, in which the transformation of glycerine into nitro-glycerine takes place, should be constantly kept cool externally with cold water.

The mixture being stirred well, it is left for five to ten minutes, and then it is poured into five to six times its volume of cold water, to which a rotating motion has been previously given. The nitro-glycerine is rapidly precipitated in the form of a heavy oil, which is collected by decantation in a deep vessel; it is then once washed with a little water, which is also decanted, and then the nitro-glycerine is poured into bottles ready for use.

In this state the nitro-glycerine is still a little acid and watery; but this is no drawback, as it is used shortly after its preparation, and these impurities in no wise impede its explosion.

2. *Properties of Nitro-Glycerine.*—Nitro-glycerine is a yellow or brownish oil, heavier than water, in which it is insoluble, but it dissolves in alcohol and ether. Exposed to a cold, even slight, but prolonged, it crystallises in long needles. A very violent shock is the best mode of making it explode. Its management is otherwise very easy, and not dangerous. Spread on the ground, it is difficult to make it take fire with a lighted match, and even then it burns but partially. A flask containing nitro-glycerine may be broken on stones without exploding it; it may be volatised without decomposition if carefully heated; but if the ebullition becomes brisk explosion is imminent.

A drop of nitro-glycerine falling on a cast-iron plate moderately hot, volatilizes quietly; if the plate is red-hot, the drop inflames immediately, and burns like a grain of powder, without noise; but if the plate is hot enough without being red-hot, for the nitro-glycerine to boil immediately, the drop is briskly decomposed, with a violent detonation.

Nitro-glycerine, especially when impure and acid, may decompose spontaneously after a certain time, with release of gas and production of oxalic and glycolic acids. It is probable that spontaneous explosions of nitro-glycerine, the disastrous effects of which the newspapers have made known, are occasioned by a similar cause. Nitro-glycerine being enclosed in well-corked bottles

the gases produced by its spontaneous decomposition cannot release themselves; they exercise a very great pressure on the nitro-glycerine, and under these circumstances the least shock and the slightest shaking may occasion an explosion. Nitro-glycerine is of a sugary, sharp, and aromatic flavour; it is also a poisonous substance. In very small doses it occasions very severe headaches. Its vapour produces like effects, and this circumstance might well be an obstacle to the use of nitro-glycerine in headings in mines, where the vapour could not be dispersed as easily as in open quarries.

Nitro-glycerine is not a properly nitrous compound, analogous to nitro-, or binitro-benzol, or to the mono-, bi-, and tri-nitrophenisic acids. For instance, under the influence of reducing bodies, such as hydrogen, glycerine is set at liberty, and caustic alkalis decompose nitro-glycerine into nitrates and glycerine.

3. *Methods of using Nitro-Glycerine.*—Supposing that it was required to detach a mass of rock at 2.50 metres or three metres (8 to 10 ft.) distance from the external edge; a hole is drilled about two to three metres (from 6ft. 6in. to 10ft.) in depth, five to six centimetres (2 to 2½ inches) in diameter; after having cleared this hole of mud, water, and sand, 1,500 to 2,000 grammes (3lbs. to 4½lbs.) of nitro-glycerine are poured into it by means of a funnel. A small cylinder, in wood, card, or tin, of about four centimetres in diameter and five to six centimetres (1⅝ inch, 2 to 2½ inches) in height, filled with powder, is then put in. This cylinder is attached to a fuze, that penetrates it a short distance, to ensure the explosion of the powder. By means of this the fuse is lowered to the surface of the glycerine, which is known by practice.

The fuse is then held steady, and fine sand is run in until the hole is entirely filled. It is unnecessary to compress or plug up the sand. The fuze is then cut off a few inches above the hole and lighted. At the end of a few minutes the fuze burns down to the cylinder and ignites the powder, which occasions a violent shock, and causes the nitro-glycerine instantly to explode. The explosion is so quick that the sand never has time to be thrown out. The whole mass of rock is raised up, displaced, settles quietly down without any being projected, and a dull report is heard. It is only on the spot that any idea can be formed of the immense force developed by the explosion. Formidable masses of rock are easily displaced, and cracked every way, and ready to be cut up by mechanical means. The principal advantage is that the stone is but little crushed, and there is but little waste. With charges of this nitro-glycerine 40 to 80 cubic metres (1,400 to 2,800 cubic feet) of pretty hard rock may be detached.

SORGHUM SUGAR.

The following is from a recent number of *Once a Week*:—

"A Sugar-yielding grass has recently been introduced into the south of Europe and North America, the cultivation of which has extended with wonderful rapidity in the United States, in regions far to the north of those adapted to the sugar-cane. It has long been cultivated in China and in Africa, partly for the sake of the sugar which is made from it, partly for its seeds, which are a good grain, similar to the Durra so extensively cultivated in the East Indies and in Africa. Durra (*Sorghum vulgare*), also known as Sorgho and Indian Millet, may almost be said to be the principal corn-plant of Africa: and the Sugar-grass, or Shaloo (*Sorghum saccharatum*), may be regarded as a superior kind of Durra. Its seeds are much larger than those of the common kinds of millet, and although the meal does not make good bread, it is very nutritious and pleasant, and is prepared in various ways as an article of food. Its productiveness exceeds that of most kinds of corn, almost rivalling the productiveness of maize. It is a tall grass, from four to eight feet high, with a diffuse and very spreading panicle. As a corn-plant, however, no attention has yet been paid to it either in Europe or in America; whilst, as a sugar-yielding plant, it has obtained an important place in agriculture. It is cultivated only to a small extent in the south of Europe, and particularly in the Veronese. Its value does not seem to have been appreciated by European farmers as it has been by those of North America, whose enterprise and perseverance have quickly turned it to great account. It can be cultivated with profit as far north as the state of Maine, and probably wherever the vine and maize can be cultivated, requiring like them a hot summer, and of about the same duration which they require. It is not, therefore, adapted to the climate of Britain, where it can only be expected to succeed in the warmest parts of England.

"The Sugar-grass was introduced into Europe by the Count de Montigny, the French Consul at Shanghai, in 1851. Of the package of seed sent by him to the Geographical Society of Paris only one seed germinated. From this single plant a small quantity of ripe seed was obtained. Messrs. Vilmorin, Andrieux, and Co., seed merchants in Paris, purchased eight hundred seeds derived from it, and paid eight hundred francs for them. Another portion of the same crop passed into the hands of the Count de Beauregard, and from these sources this seed was distributed over Europe, and thence over America. The first seeds were carried to America in 1857. Two years after, Mr. Wray brought seed from Africa to America, and two classes or varieties are now recognised there, the Chinese, or *Sorgo*, and the African, or *Imphee*. In 1862, more than 100,000 acres were devoted to the cultivation of the Sugar-grass in the United States, yielding at least 16,000,000 gallons of syrup. The extent of land thus employed has increased since that year, although the crop of 1863 was almost a failure, through a very early frost. The cultivation of the sugar-grass has hitherto been chiefly carried on in the North-Western States—Ohio producing in 1862 more than 6,000,000 gallons of syrup, and Iowa nearly 4,000,000. The Eastern States have, however, begun to engage in it.

"Mills of various kinds are employed for crushing the cane and expressing its juice. A minute description of these is unnecessary. One in common use consists of three horizontal rollers, an upper one resting on the other two. Mills with vertical rollers are also employed. The mills are wrought either by steam, water, or horses. Great part of the sugar-grass grown in America is crushed by the farmers themselves in small mills, and much of the syrup is used without being converted into sugar. The juice, as it is obtained from the mill, contains many impurities—dust and earth, small fragments of cane, and green vegetable matter. These are in part removed by filtering, and a filter of straw is often employed. They are removed more completely by skimming during the boiling of the juice, but, if no further means are adopted, so much of them still remains as to give the syrup a dingy appearance. The processes employed in procuring sugar from the sugar-cane in tropical countries are equally applicable in the case of the sugar-grass."

Fine Arts.

PHOTOGRAPHS OF NATIONAL PORTRAITS.—Photographs were taken of no less than one thousand portraits in the recent exhibition at South Kensington. This number is within thirty of the entire collection. The owners of some few portraits objected to photographs being made, and there were besides some pictures which, from blackness or other causes, could not be photographed at all. The works, however, thus excluded, did not exceed three per cent. on the entire gallery. Of this interesting series of one thousand photographs, about three hundred are

now on view at the Kensington Museum, in a sale-room placed at the service of the Arundel Society. This business transaction is in accordance with an agreement recently made between that society and the Department of Science and Art. It may be remembered that some years ago an objection was raised by the trade to the production and sale of photographs by the government. Under the plan which is now about to come into active operation, the photographs will be executed by a professional man, and the sales effected through the agency of the Arundel Society. The latter receives a percentage on all sales effected. The price to the public has been graduated, at a moderate rate, on the area of each photograph, calculated in square inches. This arrangement extends not only to the national portraits, but also to all other works previously entered in the list published by the department. In addition may be noted photographs from the miniatures exhibited a year ago, and also from the Raphael and Michael Angelo drawings at Oxford. Orders for any one or more of these photographs are received at the Museum, or at the offices of the Arundel Society, Old Bond-street. This reciprocal benefit was recommended to the members of the society by the annual report, in the following words: "The desire to co-operate with an institution from which the society has received valuable support in former years, as well as the liberality of the terms offered, induced the Council to accede to this proposal." These terms, it is understood, will yield a profit to the Arundel Society, after the payment of incidental expenses, which profit will be devoted to the general purposes of the society in the promotion of art.

Lord Macaulay.—Mr. Woolner has completed in marble the statue of the late Lord Macaulay. The figure is seated, and draped in academic robes. The work has been placed, on loan, in the Kensington Museum, prior to removal for its final destination in Trinity College, Cambridge.

Brussels Exhibition—Results of various Rates of Admission.—The Brussels Exhibition of Fine Arts was to have closed on Monday, the 8th instant, but it is said the doors will be kept open some time longer. The experiment of various rates of admission supplies a few facts of importance. The rates charged were, during the first few days, number not given, two francs; during the following fortnight, one franc; for another fortnight, half a franc; and during four days and four Sunday afternoons, ten centimes only. The produce of the two-franc days was 2,345 frs.; one-franc days, 2,469 frs.; of the half-franc days, 10,359 frs.; and of the penny days, 7,928 frs. The principal points in the above account are, that the half-franc admission produced in twelve days and four Sunday mornings more than twelve days at a franc; and that four week-days and four Sunday afternoons, at a penny, produced more than three times the amount of the twelve days at a franc. The number of visitors on those four week-days, when the admission was only one penny, is surprisingly small, the highest being 2,500, and the total only 7,947, while the four Sunday afternoons at the same charge produced nine times the amount. The comparison of the Sundays is very remarkable. In 1863, four Sundays at one franc produced only 1,288 frs.; while this year, four Sunday mornings at half the rate of admission, produced 1,800 frs.; and four Sunday afternoons, at one penny, more than 7,000 francs.

Artists in France.—Everybody knows that artists abound in France, but few people are aware what a large portion of the population are actually engaged in the various classes of the fine arts, and in relation with them. The list drawn up for the election of the various juries for the award of the Grand Prix de Rome this year gives some notion of the popularity of the upper regions of art in Paris. In painting, besides MM. Ingres, Picot, Schnetz, Conder, Brascassat, Léon Cognier, Robert-Fleury, Signol, Meissonier, Cabanel, N. A. Hesse, Lehmann, Muller, Gérôme, members of the Institute, the list includes nearly fifty decorated painters, nearly all well known men. In sculpture we find MM. Dumont, Lemaire, Seurre, Jouffroy, Guillaume, Cavelier, Perraud, Gatteaux, of the Institute, and more than thirty others. In architecture, MM. Lebas, Lesueur, Hittorff, Gilbert, De Gibors, Duban, Lefuel, Baltard, all of the Institute, and thirty-three other artists. It must be remembered that this list includes only the names of those artists who were actually available at the moment in Paris, thus the names of M. Hamon and many other celebrated artists living at a distance, and those of several architects of high repute engaged on public works, do not appear in this long list of artists of acknowledged reputation and high standing. When we find that this list, diminished as it is by the limits assigned and the accidents referred to, contained more than one hundred and fifty names, we may form some idea of the importance of the art element amongst our neighbours. It is probable that a similar list drawn up by the Academy of Arts of Brussels would exhibit a still longer list of accredited artists, in proportion to the population of this city.

Manufactures.

Metal Manufactures in France.—For some time past, the French iron works have been receiving important orders for railway material from Belgium. The works at Grafenstaeden (Bas Rhin) delivered, in 1864 and 1865, several locomotives for the Spa lines, to the frontier of Luxembourg, and to the Liege and Limbourg companies. At the end of last year the French establishment obtained the contract to furnish to the state railway a certain quantity of passenger carriages, which they have been able to construct at from 5 to 6 per cent. lower than the Belgian manufacturers. In a more recent contract the Société des Forges du Creusot tendered for the construction of nine goods engines for 56,800 francs each, and nine passenger engines at 57,500 each, in competition with a Belgian company, the prices of which were higher. The Société des Acièries of Imphy and Saint Sevrin continues in Belgium to obtain, at every competition, orders for numerous lots of tenders, wheels, axles, &c., in Bessemer steel, at lower prices than the English and Belgian manufacturers.

New Process for Bleaching Raw Wool.—M. Dullo, of Berlin, is stated to have discovered an economical method of bleaching raw wool, and thus imitating the bright white wool in the English trade. The wool is dipped into a solution of sulphate of magnesia, to which is added a certain quantity of bi-carbonate of soda; it is then slowly heated. Carbonic acid is then released, and the basic hydrated carbonate of magnesia attaches itself to the threads of wool and gives it a white colour. The wool evidently does not lose any weight. For 100 kilogrammes of wool, 5 kilogrammes of sulphate of magnesia, dissolved in water, and $3\frac{1}{2}$ kilogrammes of bi-carbonate of soda should be employed. It should be heated to about 40° Reaumur, and then allowed to cool: the greater part of the precipitate is deposited on the wool, to the surface of which it adheres. The [illegible] of the carbonate of magnesia does not alter the [illegible] and flexibility of the wood.

Ice-making in the Southern States.—There is an ice-manufacturing company at Shreveport, [illegible] working on the ammoniac vapour principle, which has declared a dividend for three months, to the 1st of September, of eighteen per cent. The company now manufactures eight thousand pounds of ice per day.

California Silk.—A silk factory has been established at San Francisco, California, and some pieces of [illegible] silk, the first products of this native industry, are to be sent to the New York State Fair.

Fibre from Stalks of the Cotton-[illegible]

entor in New Orleans has been turning his attention to he value of the stalk of the cotton-plant for the purpose ot only of thread but of cloth, and is said to have succeeded in making the former strong, fine, and every way aluable to the industrial world. The article is described s soft and pliable, and capable of being converted into a erviceable fabric. One hundred and twenty pounds of alk will turn out forty pounds of thread. A factory is be established, for the manufacture of thread and cloth, t an early day. This discovery is not new, but the pplication of the discovery has never been made till ow. It has long been known that the fibrous substance the cotton-stalk bore a strong resemblance to the fibre f flax, but the test of its adaptability as a textile material now for the first time made.

Commerce.

COCHIN CHINA A FUTURE SUGAR COUNTRY.—"The ew colony of France in Cochin China," says the *emerara Colonist*, "is a really fertile spot; its rice elds, salt works, and fisheries yielding considerable arvest and large exports. The French authorities eclare that it is likely not far hence to become a most nportant sugar-growing country. Several parts of the olony are described as admirably adapted to the sugarane, which is largely cultivated by the natives for their wn use. There are great numbers of sugar-houses, roducing various kinds of sugar, according to the ature of the soil and the modes of culture and working, ome of which are described as excellent. There are ur varieties of sugar-cane grown in Cochin China—the hite, red, green, and the red and white, but the first of ese gives the best results in the hands of the natives. he sugar obtained from it is tolerably white. A good eal is also made from the red cane; but, in consequence f the imperfections in the modes of manufacture, the igar is almost black. The canes are planted about the onth of January, after the soil has just been turned ver once, and on good lands the first crop is obtained in welve months. During the two following years, without any more labour, they get further crops of cane. he cane when cut is crushed in rough stone mills, and e juice is received in holes in the ground, from which is taken to be evaporated. Fresh sugar-cane is sold all the markets at an exceedingly low price as a weetmeat, of which the lower orders of the Annamites nd the children are excessively fond. The buffaloes elish the cane trash immensely. With such a climate s that of Cochin China, which, in addition, possesses xtraordinary means of transport, it is not hard to believe hat before long it may become a large sugar-producing ountry. Indeed, there seems no reason why Cochin hina should not eventually supply us with a good eal of sugar, and possibly tea also, as well as rice and pices."

THE CHINESE YAM.—The Chinese yam is justly steemed for its agreeable flavour, the size of its ubers, and the facility with which it is cultivated n almost barren lands. The yam has the defect of the ot increasing in length to the detriment of its thickness. killful growers have discovered a method of preventng this. The most efficacious mode is pinching off the ateral shoots, and thus forcing the sap to flow towards the entral stem. A hectare of yams may yield from 25 to 0,000 kilogrammes of roots, and cultivated as a vegetable he yam is wholesome, savoury, and even delicate, and oon will cease to be the privilege of the wealthy when all he small and poorer cultivators know how to cultivate t. Its stem is climbing, as that of the hop or clematis; t may be supported, like peas or beans, by means of sticks. he ends of the lateral shoots are pinched off only, and toards the month of September, when the stems within he roots are taken up. To reproduce the yam, the pper part of the tuber, which is thin, tough, and furnished with smaller roots, is planted; the lower part, which is large and tuberculous, is reserved for consumption. The yam may also be reproduced by seed; and by this means fresh varieties are obtained. The yam is cooked in the same manner as the potato.

BELL-FOUNDING.—Mr. H. M. Blews, in his contribution to the recently published work, entiled "Birmingham and the Midland Hardware District," writes:—This trade seems to have been unknown in Birmingham till the middle of the last century, when a foundry was in existence opposite the "Swan" at Good Knave's End, on the road to Harborne. This foundry supplied peals of bells to three adjoining parish churches in 1760. Twenty years later, one Ducker had a foundry at Holloway Head, and cast chimes, since which time there is no record of large church bells in peals having been cast in the town, although an extensive trade in other descriptions has continued to flourish and extend. Church, school, plantation, factory, and ship bells still closely adhere to the mediæval type. They vary in size from half a hundred-weight to half a ton, the largest size now cast in Birmingham. There is a great demand for them in the home and nearly every foreign market, including South America and the Colonies. Railway and dinner bells, from four to seven inches wide at the mouth, with a wooden handle attached, are largely used for domestic purposes; and the majority of railways in England, India, Russia, Brazil, &c., have been supplied from Birmingham. Musical hand-bells are still made, but the demand is very limited, as they are seldom required by any but village ringing clubs. Cattle and horse bells are oblong at the mouth, the size varying from three-and-a-half inches by two-and-a-half inches, to seven inches by three-and-a-half inches. They have conical sides, and a square iron loop at the top. They are in great demand for Australia and New Zealand, the smaller sizes being suited to the Brazilian and South American markets. Sheep bells are circular at the mouth, and an elongated semi-circle in shape, with a loop at the crown. They are used in England, and exported to the Cape, Australia, New Zealand, &c. House bells are so familiar as to need no description. Some exceedingly small bells, from ¾ to 1½ inch, are used as an article of barter in the African trade. Sleigh, dray, and caparison bells, small circular bells, with an iron ball cast inside, are largely used in Canada and India, and command a limited sale at home. During the last ten years an increasing demand has arisen for fancy, table, office, and call bells, constructed of the ordinary clockbell, mounted on a stand, and struck by the pressure of a spring. Not very long since, Messrs. Scholefield, Sons, and Goodman executed an order for 10,000 green bronzed and lacquered house bells, 12oz. in weight, for a West African Prince, to adorn his new iron palace. Messrs. J. Wilson Browne and Co. recently also received an order from another African prince for a number of polished ship bells, in elegant brass frames, and mounted on mahogany stands, some of which were engraved with the name assumed by the distinguished potentate, "Yellow Duke, Esq."

Colonies.

SOUTH AUSTRALIAN IMMIGRATION.—A colonial journal, giving an account of a monster meeting recently held in the Adelaide Town Hall, when a memorial to the Governor was adopted, deprecating the continuance of immigration at the public expense, says:—"It is natural that working men out of employment should object to the introduction of other working men to compete with them in the labour market, with the apprehended consequence in the reduction in the rate of wages. When men are in full work very little is said about immigration, but when work is slack the stoppage of it is put forth as the leading object. On the subject of immigration, it must be borne in mind

that a large portion has been assisted or nominated immigration, the working classes themselves contributing to bring out their own poor relations and friends, and asking Government to help them. This fact is overlooked by some of the public speakers upon immigration, who argue as if every immigrant was imported slowly to compete with previous arrivals. It appears South Australia is on the eve of a change in her career. It is said she will soon have to look for markets for her serial produce; and late droughts have caused much temporary and perhaps permanent damage to her pastoral prospects. Whether it is necessary to stop or check immigration for some time to come is a very important and vital question, and a great cry is raised about prosecuting public works."

DEMAND FOR LABOUR IN NEW BRUNSWICK.—Owing to the prosperous condition of this colony, there has been a large demand for skilled and unskilled labour, particularly in farming and ship building. Government has offered encouragement; and parcels of 100 acres can be purchased for the small sum of £10 10s., for cash payment, or 2s. 6d. sterling per acre, in which case three years are allowed to complete the payment; and by another mode the emigrant can obtain land by the Labour Act, and under this act no money payment is required. The conditions are that the holders of 100 acre lots shall cultivate during five years five acres, and there are nearly 200,000 acres of land in 100 acre lots, lying in nearly every section of the province. There is also a good demand for agricultural labourers, servants, and boys and girls.

NEW SOUTH WALES ABORIGINES.—For the first time for many years in New South Wales the blacks have shown themselves troublesome. They assembled to the number of about 400 on one of the Riverina districts, and enjoyed themselves with a model feast procured from the herds of the squatters, a large number of cattle having been speared. The men of the adjacent stations collected to drive the blacks away, but the latter showed fight, and the whites retired to seek the aid of the law.

POPULATION OF NEW ZEALAND.—The following is the population of the several provinces:—

Provinces.	1861.	1864.
Taranaki	2,044	4,374
Hawke's Bay	2,611	3,770
Nelson	9,952	11,910
Canterbury	16,040	32,276
Auckland	24,420	42,132
Marlborough	2,299	5,519
Wellington	12,566	14,987
Chatham Islands	50	86
Otago	27,163	49,019
Southland	1,876	8,085
Total	99,021	127,158

—showing an increase during three years of 73,137 persons.

Publications Issued.

ELECTRICITY. By R. M. Ferguson, Ph.D. (*W. and R. Chambers.*) This volume forms one of the "Chambers Educational Course." It aims at giving a popular and accurate view of the main principles of the science of electricity, and prepares the way for the technical or mathematical study of them. The work is divided into six sections, each section into chapters, and each chapter into paragraphs. This division is made with the view of conveying a clear idea of the connection of the main branches of the science, and of the various phenomena included under each. The fluid theories of electricity, on which the more usual terms of the science are based, are explained at sufficient length. They are apt, however, to convey the idea that electricity is a principle distinct from matter, an impression not borne out by experience. Throughout the work electricity is looked upon as a peculiar action which the molecules of matter under certain conditions exert on each other. A method of explanation is adapted in keeping with Faraday's theory of induction, and the manifest action of induction, in which it is assumed that electric action is one of contiguous molecules, and that nothing but molecular action travels as a current; at the same time each action is clearly described as it occurs apart from theoretical considerations. The British Association unit of resistance is adopted in the section on Galvanism, and a chapter is devoted to the method of determining it, and to the system of measurement of the current elements in electro-magnetic units. A historical sketch is given at the end of each section or chapter, in which the author and date of every important discovery or invention are noted.

A PERPETUAL CALENDAR. By John J. Bond, of the Public Record office. *(Bell and Daldy.)*—This work not only serves as an almanac for present and future years, but enables any one, having occasion to use it, to become acquainted with the old and new style of writing dates, and assigning correct days to dates according to the systems in various countries. In addition to the various uses for which it is suited it is well adapted for educational purposes, as there are many persons to whom the difference between the old and new styles is a mystery, and the date of the adoption of the latter wholly unknown.

Notes.

INDUSTRIAL PRIZES.—The Academy of Rheims has just issued its list of prizes for the years 1867, 8, and 9, one for each year; the first is a gold medal, of the value of 500 francs, for the best plan of construction of buildings, and arrangement of machinery and plant, for an establishment to combine wool-combing, spinning, and weaving. The second consists of a gold medal, of the value of 300 francs, for an exposition of the chemical composition of fire bricks generally employed in Rheims and its vicinity, and a comparative estimate of these and others. The third prize, a medal of the value of 500 francs, is offered for the best means of purifying the sewage of Rheims before it enters the river Vesle, and of applying the products to agricultural purposes; to be supported by practical proofs of the economy and facility of the means recommended.

WATERPROOFING.—The following plan of rendering tissues waterproof is said to be very effective:—Plunge the fabric into a solution containing 20 per cent. of soap, and afterwards into another solution containing the same percentage of sulphate of copper; wash the fabric, and the operation is finished. An indissoluble stearate, margarate or oleate of copper, is formed in the interstices of the tissue, which thus becomes impervious to moisture. This process is particularly recommended for rick cloths, awnings, and similar objects.

DISCOVERY OF LITHOGRAPHIC STONE IN PARIS.—In levelling the heights of the Trocadéro, for the new Place du Roi de Rome, a stratum of stone, as fine in grain as that used for hones, and from eight to twelve inches in thickness, has been laid open. A lithographer passing by the spot was struck with the resemblance of this stone to that used in his profession, and having obtained a piece, he caused it to be cut, polished and dried in an oven; and having drawn a design upon it, succeeded in obtaining a number of excellent impressions of his drawings. It is said that this valuable discovery is likely to be turned to account.

ESTABLISHMENT FOR NURSES.—It is said that a very useful new Institution, an establishment for the supply of nurses, is about to be set on foot by the authorities of Paris; the object is to enable the public to procure at the office or offices, at any hour of the day or night, attendants accustomed to the sick room, and to all the

lnties required in the case of accouchements, illness, or accident. Such an arrangement would certainly be a great boon to the inhabitants of a large city like Paris.

Microscopic Printing.—One of the objects that have excited the most curiosity in the recent exhibition at Toledo, was a complete edition of *Don Quixote*, printed in microscopic characters, on fifty-four cigarette papers, in four volumes.

The Italian Scientific Society, called The Forty.—There has existed in Italy for the last century a private foundation, quite independent of Government, the members of which, of the number of 40, are elected amongst themselves, never meet, but correspond by letter with the president. This society, which has its own funds, has published 50 large volumes of memoirs, containing the greatest works that have been produced in the departments of mathematics, physics, etc. The last president was the late M. Marianini, who is now succeeded by M. Matteucci, who was unanimously elected the 27th of last August. It is said to be the intention of this eminent philosopher to make his society become the great centre of publication of all progress of science made in Italy. After having obtained from the Minister of Public Instruction the foundation of two gold medals for the two best memoirs, published in the transactions of the society, M. Matteucci has founded, at his own expense, a third gold medal, to be given by the society to the author, in any country, of the most important discovery in natural philosophy of the year.

Moral Science Association.—On Monday the 8th instant, a conference was held in the Manchester Town-hall relative to a proposal to form a Moral Science Association. The Rev. Dr. Garrett presided, and the Rev. Dr. Cather described the intentions of the promoters of the proposed association. As there was a British Association for the Advancement of Science, and a National Association for the Promotion of Social Science, so let there be instituted an "Imperial Association for the Cultivation of Moral Science;" understanding by moral science all that was essential and practical in religion; and let this association hold an annual meeting. After an animated debate it was resolved that there was great need for the formation of a moral science association, and that it was most desirable that a Congress should be held as soon as practicable. The committee was then elected, and the procedings terminated

Proposed Maritime League in Italy.—There exist in Italy three great maritime companies—the Florio, for communication with Naples and Sicily; the Peirano, for postal service round Italy; and the Eastern Adriatic, for the service from Brindisi to Alexandria (Egypt). Now that Venice has become a part of the kingdom of Italy, it becomes necessary to connect it with these companies, and an opinion prevails that the only way to do so is to link it with the East by the creation of an establishment to rival the Austrian Lloyd's at Trieste. The wish therefore is to make Venice, in respect to this last, the head of a maritime league, and the Italian Government is said to desire this result. The Chamber of Commerce of Venice has already spontaneously occupied itself with the question, and sent delegates to Florence. The organisation in that port of an Italian Lloyd's is not considered of difficult realisation. People go from Alexandria to Brindisi, and the object now is to secure conveyance from the latter place to Venice. It appears that the Company which now works the service from Alexandria to Brindisi is ready to carry it on to Venice on the day that the king shall make his entry there, and that they offer to organise an immediate and uninterrupted service between that port and Egypt.

Packing in India Rubber.—France exports yearly more than a hundred million cases of fine wines, brandies, or liqueurs; and bottles, packed up to the present time in canvas, straw, or hay, cause a great deal of inconvenience and loss, both of time and money. For one house only, such as the Maison Hennessy, of Cognac, who alone export millions of bottles, this loss of time and money is estimated at about 100,000 francs. It occurred to a M. Becker, of Bordeaux, that india-rubber being incapable of transmitting vibration, small rings of it placed around bottles might be advantageously employed to keep them apart, from jarring, and, consequently, from breakage. It has been tried, and is said to have succeeded admirably. Many commercial houses of the Gironde, of Charente, and of Champagne have availed themselves of his process. The rings of india-rubber, after unpacking, are put aside, and are again ready for use, whilst the hay or straw, commonly used for packing purposes, would be thrown away.

Russo-American Telegraph.—Nearly the whole of the surveys on land and the soundings in Behrings Straits are completed. The following works will be completed this year, distributed amongst several sections. The line of telegraph will be lengthened 800 miles beyond the Port of Granley to Kvitchpok, and further in the valley of the Anadyr from its mouth to the Island of Anadyrik, from Okhotsk to Guijigumik, and, perhaps, to the junction with the Anadyr section. The cables that are to be laid between the Bays of Grantly and Jeniaum (184 miles) and the Capes of Sponty and Solstoï are to be shipped in the course of the present month.

Various Trades of Paris.—At the present time there are in Paris 15 makers of reeds for clarionets, bassoons, and hautboys, 12 workers in horn, 18 gut workers, 4 makers of crutches, 10 drum-case makers, 12 sugar-plum makers, 13 firemen's helmet and axe manufacturers, 9 foot-warmer manufacturers, 30 wholesale silk-twist dealers, 19 dealers in hair, 15 muzzle-makers, 22 watchguard makers, 49 dressers of hare skins for hat-making, 9 breeches makers, 3 damask workers, 1 breaker-up of carriages, 6 embalmers, 5 incense makers, 8 curry-comb makers, 3 harp makers, 3 makers of snuffers, 16 coffee mill makers, 18 wholesale dealers in mustard, 4 stone polishers, 3 almond cake makers, 10 metal eye-hole makers, 23 ginger-bread makers, 7 lightning-conductor makers, 2 skate makers, 16 dealers in rabbit skins, 40 corn-cutters, 5 wafer-cake makers, 7 speaking-trumpet makers, 3 bee-hive makers, 2 dealers in bullocks' blood for refineries, 13 dealers in leeches, 8 makers of wooden blocks for hair dressers and milliners, 3 corkscrew makers, 16 dealers in vanilla, 8 pastrycook's jacket makers, and 12 artificial eye makers.

Paris Exhibition.—The principal industrial establishments in Italy are now actively preparing themselves for the great competition at the Universal Exhibition of 1867. At Florence several tables (unique in their kind) are being made. One is an oval-shaped table, representing in the centre the attributes of Bacchus, with a border of flowers, admirably executed; the parchment of a tambourine in Siberian jasper, the hoop of the instument in petrified wood, the bells in Volterra jasper imitating the reflexion of the copper; a wand of Bacchus, likewise in petrified wood, the pores and the knots of which may be readily distinguished; bunches of grapes in Oriental alabaster, of a delicious pearly transparency, the vine leaves in Sicilian jasper, with the warm and red tones of autumn upon them, birds with wings half open, flowers scattered about here and there, variegated camelias, blue bells in lapis-lazuli twined around the branches, the fine grain of the stones giving them a freshness, a brilliancy, and life-like appearance.

Correspondence.

Paris Exhibition of 1867.—Sir,—In reference to your invitation, contained in the *Journal* of the 28th of September, page 700, I beg to say a few words relative to the new prizes offered to the competition of the world by the Imperial Commission. The terms of the announcement are undoubtedly vague, but I do not think it at all difficult to comprehend from them what the intention is.

The words used are—"Un ordre distinct de récompenses est crée en faveur des personnes, des établissements ou des localités qui, par une organization ou des institutions spéciales, ont développé la bonne harmonie entre tous ceux qui coopèrent aux mêmes travaux et ont assuré aux ouvriers le bien-être matériel, moral, et intellectuel." Now the translation of this passage, as given in the letter of "A Puzzled Reader" to the *Times*, contains one word more than is in the original, and this surplusage adds somewhat to the obscurity complained of; the phrase, "by a special organization or special institutions," should, I think, have been "by organization or special institutions"—that is to say, either by the reorganization of an old establishment or the setting up of a new one, the word institution not having exactly the same value in the two languages. With this alteration the prize, then, may be given either to the originator, organizer, or manager of an establishment. This point cleared up, I come to another—that of co-operation; here again I think the meaning has been slightly perverted; the French phrase does not necessarily include any idea of a co-operative establishment, but merely refers to the harmony produced amongst all parties engaged in the work, whatever that may be—harmony amongst employers, directors, and workmen. It seems to me, then, that the intention is tolerably clear, and that the prizes are offered to those who have been the agents in producing the largest amount of harmony, combined with the material, moral, and intellectual well-being of the workmen employed in any industrial establishment, for the word *ouvrier* clearly excludes any institution not industrial. It seems to me therefore that "hospitals, clubs, museums," or colleges would not come within the conditions named, and that the prizes are intended to be given to those who have done most for the material, moral, and intellectual well-being of all employed in productive establishments. The great prize seems therefore intended for the founder, organizer, or reorganizer of that industrial establishment which presents the most remarkable arrangements for the comfort, morality, and educational improvement of all engaged therein. It is rather invidious to name any one establishment, but it seems to me that Mr. Titus Salt's working town of Saltaire, "with its complete sanitary arrangements, its schools, chapels, clubs, halls, and perfect factory organization," exactly fulfils all the conditions laid down by the Imperial Commission; and I may add that I believe England can produce its fair share of worthy candidates for the minor prizes in question. It must not be forgotten, however, that of late years our neighbours have done much, not only in the organization of industrial establishments, but also for the material, moral, and intellectual well-being of the working classes, and that the competition will be all the more honourable from the fact that we shall have to compete with worthy and redoubtable rivals.—I am, &c., G. W. Yapp.

Patents.

From Commissioners of Patents' Journal, October 5th.

Grants of Provisional Protection.

Ammonia, &c., making—2362—G. Robinson.
Bath, combined with travelling trunk, and self-rocking cradle—2391—W. H. Bailey.
Bottles—2399—A. S. Stocker.
Bottles, &c., closing—2361—J. J. Baranowski.
Boxes or cases—2370—R. Couchman.
Braiding machines and warp regulators—2369—W. Tunstill.
Bricks—2386—J. H. Johnson.
Buildings, heating—2396—H. J. Newcome.
Fibrous materials, cleansing—2352—J. L. Norton.
Fibrous materials, spinning—2382—J. Dunn.
Fibrous matters, preparing—2375—C. C. Connor.
Fibrous substances, cleaning, &c.—1906—E. Leigh, H. T. Palmer, and W. H. Whitehead.
Fibrous substances, treating—2369—E. Nelson.
File blanks, grinding—2385—J. Dodge.
Fish hooks—2368—J. Bindley.
Grain from straw, separating—2394—W. E. Gedge.
Grain, separating, &c.—2177—J. T. Poyser.
Horse hay rakes—2358—R. R. Riches and C. J. Watts.
Iron—2374—B. Bayliss.
Iron, smelting—2390—G. Dyson.
Kites—2089—J. W. Hoffman and G. R. Wilson.
Latitude and longitude, obtaining—2363—C. F. Varley.
Letter boxes and pillars—2404—W. Dennis.
Life at sea, saving—1514—H. W. Hire and J. White.
Metallic pistons—2366—A. Oldham.
Metals, planing—2406—E. Barlow and W. N. Dack.
Metal spring cases for cigars, &c.—2359—C. H. Cheshire.
Oil from shale, making—2380—P. Brash and W. Young.
Pneumatic steam dredging machines—2407—W. E. Gedge.
Printing machines—2403—H. S. Cropper.
Pulley blocks—2398—H. W. Ley.
Purses, &c., clips or fastenings for the bands of—2373—T. New.
Railways—2384—W. E. Gedge.
Railway trains, communication between the guard and passengers—2097—J. W. Hoffman and G. R. Wilson.
Sausage-making and mincing machine—2402—G. Keene.
Screw nuts, turning—2392—J. Thompson.
Ships' anchors—2356—J. H. Betteley.
Ships' anchors—2379—J. Jackson.
Shipwreck, saving life in cases of—2123—W. E. Newton.
Show cases—2401—F. Sage.
Soluble alkaline silicates—1959—L. Migaut.
Steam boilers—2378—J. Twibill.
Steam boilers—2408—T. Dixon.
Steam boilers, cleaning the tubes of—2387—D. McDowall.
Steam engines—2405—E. Barlow and W. N. Dack.
Substances, cutting frets in—2365—J. H. Johnson.
Substances, cutting, &c.—2364—C. P. Stewart and H. Chapman.
Substances, drying, &c.—2376—W. Creasy.
Textile fabrics, cutting—2350—E. Phillips and J. Howie.
Travelling bags—2354—R. Robinson.
Tube cutters—2395—T. Parkes.
Valves—2248—H. G. Scott and N. Hallowell.
Violins, &c.—2071—H. Bell.
Water tuyeres—2372—N. Dunn.
Whips, &c.—2371—J. Keyston.
Winding apparatus—2367—J. Boyd, J. McPherson, T. K. Kerr, and J. Taylor.
Wire, straining—2397—J. H. Sams.
Wood, preserving—2245—A. de la Gautraye.

Inventions with Complete Specifications Filed.

Bronzing machines—2484—G. Haseltine.
Files, cutting—2490—A. F. Johnson and M. P. Griffin.
Water, raising—2483—H. A. Bonneville.

Patents Sealed.

955. G. P. Wheeler.	983. J. H. Johnson.
956. F. Wise.	997. E. T. Hughes.
957. P. J. Macaigne.	1000. W. Gilseath.
958. A. A. Hely and J. Marshall.	1004. J. L. David.
959. W. Betts.	1005. R. W. Thomas.
960. J. H. Johnson.	1033. J. Crofts.
962. W. Howitt.	1035. W. Clark.
969. F. Robiere.	1044. H. B. James.
970. G. Allix.	1057. C. H. Murray & [illegible]
974. S. Richards.	1061. H. A. Bonneville.
977. B. Johnson.	1472. H. A. Bonneville.
981. F. E. Walker.	1088. T. S. Hales.
982. W. H. Phillips.	

From Commissioners of Patents' Journal, October 9th.

Patents Sealed.

1009. B. F. Weatherdon.	1219. G. Davies.
1012. I. M. and S. MacGeorge.	1232. O. C. Denis.
1015. S. J. Sherman.	1236. J. Jackson.
1018. T. P. Tregaskis.	1241. J. and G. Sherratt.
1019. R. Leake, W. Shields, and J. Beckett.	1287. J. L. Booth.
	1333. W. E. Newton.
1023. J. Sparrow and S. Poole.	1341. T. Hunt.
1028. J. Frost.	1372. W. Gerard.
1029. W. Young.	1379. G. Haseltine.
1030. W. Wishart.	1381. W. de la Rue and [illegible]
1032. J., J., and J. Crabtree.	1383. H. Muller and [illegible]
1048. W. Clark.	1404. W. E. Newton.
1072. J. Hayes, sen., and J. and J. Hayes, jun.	1839. A. H. Brown.
	1862. P. Highatt.
1090. J. Marshall.	1860. E. Drum.
1099. E. Tuttle.	1999. H. J. Barrett.
1100. G. Beadon.	2112. A. L. West.
1136. M. Nelson.	

Patents on which the Stamp Duty of £50 has been Paid.

2444. R. A. Brooman.	2428. J. Tinline.
2491. T. Hughes.	

Patent on which the Stamp Duty of £100 has been Paid.

2235. E. Morewood.	2291. W. Isles.
2236. W. Brookes.	23[illegible] [illegible]
2274. E. O'Connell.	[illegible]

Journal of the Society of Arts.

FRIDAY, OCTOBER 19, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade*, obtain the highest number of marks, with a certificate, in those subjects respectively.

Proceedings of the Society.

CANTOR LECTURES.

"ON THE SYNTHESIS AND PRODUCTION OF ORGANIC SUBSTANCES AND THE APPLICATION WHICH SOME OF THEM RECEIVE IN MANUFACTURES." BY DR. F. CRACE CALVERT, F.R.S., F.C.S., &c.

LECTURE III.

DELIVERED ON FRIDAY, APRIL 20TH.

On the Transformation of Organic Acids and Neutral Substances.

Among the various subjects which I had the pleasure of bringing before you during my last lecture, I referred to the curious fact that, when 70 parts of alcohol are carefully mixed with 100 parts of strong sulphuric acid, and the whole is left together for twenty-four hours, and then submitted to a heat of 284° Fahrenheit, the alcohol which it contained unfolds itself into ether and water; and that when once this action had taken place, as Liebig and Mitscherlich observed, any further quantity of alcohol added unfolds itself into ether and water, and this peculiar action continues; that we were bound, therefore, to conclude that the acid fluid in the retort had the power to unfold alcohol into the substances above stated; and that this class of action had received the name of catalytic action, or action of contact. These classes of chemical phenomena are so important, not only in a scientific point of view, but also in a practical one, and they are called upon to unravel to us such important and useful results, that I am sure you will excuse me if I take the liberty of bringing before you one or two more instances, so that you may have a clear insight into those peculiar classes of chemical action, and be able to distinguish them from other series of chemical facts which, at first sight, appear identical, but which, in reality, differ widely when closely examined. I cannot do better than describe the first case of catalytic action which was observed in science by the late eminent chemist Mitscherlich. If in two retorts of the same diameter is introduced chlorate of potash, and in one of them 10 per cent. of oxide of copper is added, and heat applied to both retorts the following facts will be observed:—In the retort containing only chlorate of potash the salt will melt when it has reached a temperature of 400° or 500°, and give off oxygen; the action then will subside, and if the temperature be slightly raised to 600° or 700°, then torrents of oxygen will escape, and, unless care be taken, some of the peaty mass of chloride of potassium will rise in the cold neck of the retort, break it, and allow the mass to escape, and therefore great care must be taken to avoid accidents. But if heat be applied to the retort which contains chlorate of potash and oxide of copper, oxygen will be liberated at a far lower temperature, and its production can be regulated with the greatest facility; the chlorate of potash does not enter into fusion, and the mass remains solid. If the product left in the retort is examined after the whole of the oxygen has been liberated, chloride of potassium will be found in both retorts, and the oxide of copper will be found in the same state as it was before it was mixed with the chlorate of potash. Therefore, this substance has undergone no change, but still it has completely modified the *modus operandi* of the decomposition of the chlorate of potash. From these facts we are justified in coming to the conclusion that the oxide of copper has acted, either by its contact with the chlorate of potash, or by a peculiar force or property which has received the name of catalytic force. This simple instance of catalytic action will enable you to appreciate more fully the following one, due to M. Berthelot, and which presents much interest, owing to the fact that it has placed at our disposal, in such quantities as to render it a commercial article, a product which I mentioned in my first lecture, and also in the last one, I mean formic acid, which, if you remember, was produced in the first instance by placing some platinum black in a watch-glass which was suspended over a vessel containing wood naphtha, the whole being covered with a bell-jar; and I further stated that the platinum black, having absorbed, condensed, and I might perhaps say liquefied, in its porous texture, the oxygen of the atmosphere, brought it into such a state as to unite with the vapours of the wood naphtha as they arrived in their turn on the surface, and by oxidising them, to convert them into formic acid. The next example was the production of formic acid by acting upon sugar with a mixture of sulphuric acid and peroxide of manganese. The mode of production to which we are now going to refer, is due, as above stated, to catalytic action. It consists in heating a mixture of glycerine and oxalic acid, when the latter substance unfolds itself into water, formic and carbonic acids, as shown by the following formula:—

$$C_4\,H_2\,O_8\,4\,HO = C_2\,H_2\,O_4 + 4\,HO + C_2\,O_4$$

If then water be added, and the temperature raised, formic acid distils, and, notwithstanding these chemical decompositions of oxalic acid, the glycerine has undergone no change.

M. Lorin has investigated closely this catalytic action, and has published lately a most interesting paper on the unfolding of oxalic acid in contact with glycerine. He has observed that if in a retort glycerine is heated to 180°, and oxalic acid is gradually added to it, every successive quantity added will unfold itself in accordance with the above formulæ. The consequence is that with a few pounds of glycerine several hundred weights of oxalic acid can be unfolded into formic and carbonic acids, *plus* water. He has further observed that if instead of taking oxalic acid such as is found in commerce, and which is composed of one chemical equivalent of oxalic acid united with three equivalents of water, he takes the same acid and heats it gently, so as to drive from it two proportions of water out of three that it contains, and that if then he adds this modified oxalic acid to some heated glycerine, he gets a very strong solution of formic acid, in fact one which contains 75 per cent.

Before parting with the interesting subject of catalytic actions, let me call back to your memory a most interesting series of facts which I described to you in my first course of Cantor Lectures, and which had reference

to Belmontine candles and other fatty acid products, manufactured by Price's Patent Candle Company, under the superintendence and by the processes discovered and perfected by the talented Mr. George Wilson, F.R.S. No doubt you will remember, without my again entering into details, that this valuable process consists in unfolding fatty matters into acids and glycerine under the influence of heat and sulphuric acid, and that I drew your special attention to the curious fact that he had gradually decreased the proportions of vitriol until he had succeeded in unfolding fatty matters into the above substances by means of two or three per cent. of sulphuric acid with the aid of a temperature of 560°, and that he had succeeded in removing from the still in which the decomposition took place the fatty acids and theglycerine by means of superheated steam having a temperature of 560°. In my opinion the unfolding of fatty matters into fatty acids and glycerine under these circumstances, viz., by a few per cent. of sulphuric acid, must be referred to a catalytic action, the amount of vitriol being so small as compared with the amount of molecular work effected under its influence.

I shall now have the pleasure of calling your attention to the artificial production of a beautiful and useful acid called benzoic, which has acquired of late years much interest, owing to the fact that it has been used in the production of aniline colours, especially blues and purples. Benzoic acid presents itself under the form of white brilliant prismatic needles, slightly soluble in water, but freely so in alcohol, and although it is inodorous when quite pure, still, generally speaking, it has an agreeable aromatic odour. It is found abundantly in nature. Thus it has been observed to exist in the pods of vanilla, in the bark of the birch tree, of the *Calamus aromaticus*, and also in that of the *Guiacum officinale*, and in several varieties of mushrooms. But it is principally found in large quantities and extracted from gum benzoin by the following process: — Some of the pulverized resin is mixed with sand, and the whole is placed in a small earthenware vessel, covering it first with a sheet of filter-paper, and surmounting the whole with a paper cone, and applying a gentle heat, when benzoic acid will be converted into vapour, sublimated and condensed in the cone under the form of fine brilliant needles which only require to be collected. Benzoic acid can also be obtained by boiling gum benzoin with a milk of lime; soluble benzoate of lime is produced, which is removed from the excess of useless resinous matters, and on the addition of an acid to the benzoate of lime in solution, benzoic acid is liberated and crystallizes.

Allow me to lay before you two or three curious instances in which benzoic acid is produced, and which have a special interest, as the sources from which it is derived differ widely one from another. The first instance is its production from the essence of bitter almonds, which is generated when bitter almonds are crushed and mixed with warm water; the peculiar ferment which they contain, called emulsin, acts upon a white solid crystalline body, amygdaline, and unfolds it into hydride of benzoyl, formic and prussic acids, which mixture is called the essence of bitter almonds, and which, as I have told you, I believe, on some former occasion, should be used but sparingly for culinary purposes, in consequence of the prussic acid it contains. When essence of bitter almonds is exposed to the atmosphere the hydride of benzoyl absorbs oxygen, and is thereby converted into benzoic acid.

The second source from which benzoic acid can be derived is widely different from that which we have just been examining, for it is obtained from the urine of herbivorous animals, by allowing the same to ferment, and then boiling it with hydro-chloric acid, when, after concentration, it yields benzoic acid, although this acid does not exist in the urine already formed. It is derived from a substance which is always a component part of the urine of herbivorous animals, and which has been named by Liebig hippuric acid. This acid represents in the urine of the animals the urea found in that of man, and the uric acid existing in that of the carnivorous animals, reptiles, and birds. All these substances are nitrogenated, and may be considered as products resulting from the decomposition of tissues destroyed by the wear and tear of life, and which have to be removed to give room for the formation of the new tissues, which are constantly being formed to maintain vitality, and these refuse products are slowly and gradually oxidised during their passage in the blood, and are thereby transformed into hippuric acid, urea, and uric acid; therefore it is the hippuric acid which exists in the urine of herbivorous animals that yields, under the influence of hydro-chloric acid, benzoic acid, and a nitrogenated substance called glycocoll. What will, I hope, carry to your minds the conviction that benzoic acid is a derivative from hippuric acid, is the fact that Dr. Stenhouse some years ago took some benzoic acid, and was able to trace the presence of hippuric acid in secretions of his kidneys, leaving no doubt that benzoic acid could be converted into hippuric. Two or three years ago, the demand for benzoic acid being rather large, induced several chemists to try to discover a cheap method of producing it. After a few months' labour, Messrs. Depouilly succeeded in obtaining it from a coal tar refuse, the only one which, up to that time, had not received any useful application in arts and manufactures. They arrived at these useful results by a series of chemical transformations, which I propose now to lay before you. They take the white crystallised substance called napthaline, which they convert into bi-chloride of napthaline by acting upon it with a mixture of chlorate of potash and muriatic acid. This product once obtained and isolated is converted, by the action of nitric acid upon it into a white substance, called phthalic acid, which, in its turn, is mixed with lime, and the mixture, on being heated at a temperature of 662° Fahr., unfolds itself into carbonate and benzoate of lime. It is only then necessary to act upon these products with hydro-chloric acid when chloride of calcium is formed, carbonic acid escapes, and the benzoic acid dissolves in the water, from which it is easily extracted.

I cannot leave this part of my lecture without referring to the interesting fact that if napthalin is acted upon with nitric acid, it is gradually transformed into phthalic acid, and that the same product is obtainable when the colour-giving principle of madder called alizarine is submitted to the same action, which leads us to surmise that there is a connection between napthalin and the colour-giving principle of madder roots.

Every person in this room is no doubt well acquainted with a white crystallised substance called tartaric acid, which is extracted from cream of tartar, and is a product of vinous liquors when allowed to "age," and which constitutes what is called the "crust" of wine. As tartaric acid is extensively used in calico printing to obtain steam blue and greens, by mixing it with prussiate of tin, and also for making seidlitz powders, as well as a substitute for yeast or barm in the manufacture of bread when added to carbonate of soda, the price of the article often reaches a comparatively high figure. Great efforts have, therefore, been made to produce this acid artificially. Baron Liebig published a few years ago a simple process to obtain tartaric acid, but though interesting in a scientific point of view, it has not, to the best of my knowledge, been adopted by manufacturers. It consists in acting with nitric acid on sugar of milk, or lactarin, a substance which I told you in my last year's lectures exists in large quantities in milk. When tartaric acid is fused with caustic potash it unfolds itself into oxalic and acetic acids, as shown by this formula: —

$$C_8\ H_4\ O_{10},\ 2\ HO + 3\ (KO\ HO) =$$
Tartaric acid. Potash.

$$KO\ C_4\ H_3\ O_3 + 2\ KO\ C_4\ H_6 + 3\ H_2\ O_2$$
Acetate of potash. Oxalate of potash.

As oxalic and acetic acids are easily obtainable from sugar, and as sugar in its turn is easily procurable from starch, and as starch is isomeric with fibrous matters called lignin, you will, from the chemical knowledge you have now acquired of the transformation of one organic substance into another, very easily conceive how tartaric acid can be derived from the vegetable kingdom.

Allow me to dwell for a few minutes on the artificial production of an acid called aconitic, and which is found in nature to exist in the aconite or wolfbane—a plant which from its beautiful flower is one of the ornaments of our gardens. Aconitic acid is produced artificially from an acid well known to all of us, called citric acid, which exists in large quantities in oranges, lemons, &c., and which is used extensively for preparing lemonades, and also in our print works as a discharge or a reserve—that is to say, to reserve on a piece of fabric white spots or white designs, or, in other terms, to prevent that part of the fabric from being coloured. It is also employed, as I have stated, as a discharge; I mean to remove from dyed calico fabrics certain portions of colour. The white designs on black pieces of calico are generally produced by this method. To convert citric acid into aconitic, all that is necessary is to maintain citric acid at a temperature of 366° for a short time, when it loses two chemical proportions of water and becomes converted into aconitic acid. Citric acid is also susceptible of another conversion. Dr. Phipson, by acting with a solution of permanganate of potash on one of citric acid, has succeeded in converting it into acetic and succinic acids—the latter being an acid which a few years since was only obtainable through the destructive distillation of amber, a peculiar mineral, found principally in lime formations, and much employed, as you are aware, in the manufacture of fancy articles. Succinic acid can also be obtained by allowing the mountain ash berries to enter into fermentation for a few days, when the malic acid which they contain is converted into succinic acid; but the principal source from which chemists at the present day obtain succinic acid, much used in chemical analysis, especially to separate iron from other metallic oxides, is by acting upon olive oil with nitric acid, when, among other products generated, succinic acid is formed.

Permit me now to dwell on the transformations of another organic acid, malic acid, found abundantly in nature, more so, in fact, than either tartaric or citric acid, and which exists in a great number of plants, among which may be cited rhubarb, apples, pears, and consequently cider, &c. If it is less known than tartaric or citric acid, this is due to its being a liquid and its extraction difficult and uncertain, and when obtained it does not present that sightly appearance necessary to render it a mercantile article. Notwithstanding the difficulties attending its extraction, chemists have succeeded in converting this acid into two solid acids found in nature, one called equisetic, extracted from the equisetum, or mare-tail plant, and also into fumaric acid, easily obtained from the common fumatory. To convert malic acid into fumaric acid all that is required is to heat malic acid to a temperature of 266,° when, strange to say, the malic acid absorbs no elements nor loses any, but each equivalent of this acid unfolds itself into two equivalents of fumaric. To produce equisetic acid, malic acid is heated to a temperature of about 280°, when it loses two equivalents of water, and becomes converted into equisetic acid. If to malic acid you add dry ammonia, you obtain a substance called malamide, which is isomeric in composition, with one found abundantly in nature, which is white, crystallised, and tasteless, and which bears the name of asparagin, being easily obtained by concentrating the expressed juices of asparagus, liquorice root, marsh mallow root, and potatoes, and which is also produced under the following curious circumstances, namely, that if peas are grown in the open air neither they nor the plant contain asparagin, but if they are allowed to germinate in the dark this substance will be found in the young shoots.

There is the artificial reproduction of a substance to which I shall briefly allude; it is one which chemists have much admired, not only in consequence of the scientific methods which have been devised to obtain it, but because it was the first reproduction of an organic matter which itself was the result of the decomposition of others under the influence of vital action, that is urea, which is one of the most important substances generated in man. Urea exists in the proportion of 400 or 500 grains in the daily secretion of the human body, and is the chief product resulting from the modification which animal matters undergo when they have fulfilled their appointed functions in the human body, and have been destroyed by the tear and wear of life, and have to be replaced by the new cells of fresh tissues. Urea is a white substance, crystallising in well-defined prisms, soluble in water and alcohol, which, under the influence of a peculiar ferment which accompanies it in the secretion of the kidneys, unfolds itself with facility into carbonate of ammonia by absorbing two equivalents of water, thus explaining the pungent odour that the fluid of the kidneys acquires when kept and allowed to enter into fermentation. Wöhler was the eminent chemist who first reproduced from mineral elements, urea; and he effected this important result by acting on cyanate of silver with chloride of ammonium, giving rise to chloride of silver and cyanate of ammonia, or urea. But Liebig was the chemist who gave us a method by which we can prepare that substance in large quantities. It consists in heating on an iron plate a mixture of four parts of ferrocyanide of potassium with one part of peroxide of manganese, and after the mass has undergone a chemical action it is found to be a mixture of cyanide of potash, carbonate of potash, and oxide of manganese. If the mass is treated with alcohol, and sulphate of ammonia added, sulphate of potash is produced, and falls as an insoluble body, whilst the cyanate of ammonia or urea remains in the solution, and can be obtained under the form of well-defined crystals, which are identical in appearance and properties with those which can be obtained from the daily secretions of man.

In connection with this subject there is a series of facts which deserve our peculiar attention, as they offer to us a remarkable example of organic substances differing widely in their properties, and in their relations to each other, although built out of the same elements and in the same proportions. Thus Baron Liebig and Wöhler published, some years since, the following curious and interesting instance where they showed that, by the grouping of the same elements, the three following curious substances were produced:—

Cyanic acid....	$C_2\ NO + HO$	or	$Cy.\ O + HO$
Fulminic acid..	$2(C_2\ NO + HO)$	or	$2\ Cy.\ O + 2\ HO$
Cyanuric acid..	$3(C_2\ NO + HO)$	or	$3\ Cy.\ O + 3\ HO$

By this diagram you will observe that fulminic acid only differs from cyanic by the elements being doubled, and that cyanuric contains the same elements, only they are tripled. But these interesting facts are not confined to a mere play of chemical formulæ, as they represent substances which are widely different in their properties. Thus cyanic acid is a transparent liquid, extremely volatile, having a most powerful and pungent odour, and acting as a violent caustic when brought in contact with the human skin, producing blisters and most intense pain. This substance, however, when kept for a short of time, undergoes a molecular change, and becomes a solid, which does not possess any of the caustic proeprties of its Protean father.

Cyanuric acid, on the other hand, is a solid, which has no odour, but has a slight, feeble acid taste, and is only sparingly soluble in water, and is often produced when organic matters are decomposed under the influence of heat. Fulminic acid does not exist in a free state. We only know it as combined with metallic oxides, and the most remarkable compound known to us is the fulminate of mercury; that is to say, the substance which, when mixed with a little nitre and gum, fills up the percussion caps, so extensively used at the present day in warfare. To produce fulminate of mercury, one part of mercury is dissolved in twelve parts of nitric acid, to which are added eleven parts of alcohol at 80° of strength. After a short time a most violent chemical reaction ensues, the result of which is to give birth to white opaque crystals of fulminate of mercury, which only require to be separated and dried to constitute that substance. It is certainly interesting to reflect on the fact that bodies having such widely different properties, and which may be derived from such widely different sources, should all have a similar if not an identical chemical composition. In fact, every 100 parts of them contain the same amount of carbon, nitrogen, and oxygen, and they could not have been distinguished in this respect had it not been for the eminent labours of Liebig.

I cannot part from you this evening without drawing your attention to the artificial production of a substance called allantoin, discovered by Vauquelin and Buniva in the amniotic fluid contained in the amnios membrane of the cow. This result was obtained a few years since by Wöhler, in acting on a substance well known to you at the present time from the remarks I made upon it last year, and found in small quantities in the urine of man, but in large quantities in the urine of carnivorous animals, and constituting almost entirely the excrements of birds and reptiles—namely, uric acid. Wöhler, by oxidizing uric acid with peroxide of lead suspended in water, produced a white crystallised substance, which proved on investigation to be that which Vauquelin and Buniva had found many years previously as a product of vitality; and I am certain you will not be surprised when you reflect on the origin of this substance, especially in a chemical point of view, to hear that it can be unfolded into urea, of which we have just been speaking, and into an acid called allanturic, a second product of decomposition.

These series of facts must at once convince you how deeply chemistry is penetrating into the field of medical science, and what an immense service it promises to render to therapeutics and physiology, as it developes itself, and inquires more deeply into the phenomena which take place in the human body. But it is much to be regretted that so few men devote their attention to that branch of inquiry. There are not at the present time in Europe more than half-a-dozen medical men, such as Bence Jones and Marcet in England, Bischof in Germany, Claude Bernard in France, who may be cited as brilliant examples of what so many of their colleagues ought to imitate.

Proceedings of Institutions.

GAINSBOROUGH MECHANICS' INSTITUTION.—On Thursday, the 11th instant, the annual *soirée* took place in the Priory Hall, Captain Challoner, R.N., president, being in the chair. On the platform were the chief residents of the district, and the hall was well filled. Special addresses were delivered by Mr. J. W. Pease, M.P., and Mr. Henry H. Sales.

NORTHALLERTON MECHANICS' INSTITUTION. — The annual meeting was held in the Court House, on Monday evening, the 8th instant. The chair was taken by Lord Teignmouth. The report was read by Dr. Walton, jun., and directed attention to the steady progress made by the Institution. An address was given by Mr. Henry H. Sales, on "Helps for Working Men."

FACTORY SMOKE.

At the meeting of the Social Science Association at Manchester, the following papers were read:—

DR. ANGUS SMITH, F.R.S., remarked that warm interest had compelled him for many years to attend to the condition of the air of towns. Habit had no power of rendering smoke pleasant. Few men living in a smoky town required to be convinced that they were in the daily endurance of a monstrous evil. Many substances made their appearance as smoke from chimneys; that to be now considered was coal smoke. Some time ago he calculated that sixty tons of carbonaceous matter were sent off in a day into the atmosphere in Manchester. A very small amount affected the atmosphere; a grain, or 18 cubic feet, was sufficient to convert good air into Manchester air, so far as carbon was concerned. About one-half the colour was due to tarry matter, and the other half to black carbon only. Dr. Smith continued:—This black matter is the colouring material of all our smoky towns, and, to a great extent, of the clothes, as well as of the persons, of the inhabitants. We live in houses coloured by it, and we walk on roads coloured by it, and we can see the sun, the moon, and the heavens only after they have been, to our eyes, coloured by this universal tincture. These are calamities of themselves; but, although some men would look on such a view of the case as mere sentiment, not one amongst us can fail to have his spirits tinged with the darkness of the sky. I found this strangely corroborated lately. One of the best men of business in Manchester informed me that on an atmospherically dull day no one would give a high price for goods, no one had the courage to give it; but on the other hand they could buy goods at a lower price, the seller had not the courage to hope for better. These dull days are caused in part by the climate, but their remarkable oppressiveness is unquestionably due in great part to the smoke. We do not consider that by the smoke we make we are affecting our own spirits and clouding our own judgment. It is my belief that this effect on the spirits is the most powerful of all objections to smoke, even in the minds of those who believe themselves above such feelings. There, is, however, no denying the great fact that everything coming in contact with a smoky atmosphere is so blackened that cleaning becomes difficult or impossible. Smoke gives to every household it visits, either a greater amount of labour or a lower social appearance. Dr. Smith proceeded to show that the poor paid directly for the smoke, living where it prevailed, and that the middle-classes and the wealthy suffered proportionately in being compelled to live out of town, and to spend time in going to and fro. Dr. Smith remarked that it was quite true that carbon, tar, and sulphuric acids were disinfectants; but we did not wish to breathe them constantly—we could not live on medicines. The disinfecting power of smoke had not rid us of disease, nor did it prevent occasional pestilences. If it did good, it did more evil, and much of the mortality of Manchester must be attributed to smoke. It had been said that if the carbon was thoroughly burned the amount of sulphurous acid would be so great as to be intolerable; but when the blackness was removed the sulphuric acid seemed to escape more easily. The very stones decay under the constant action of acid, and the bricks crumble more rapidly. Even in places less troubled with smoke, we see the decay. The Parliament Houses, built to remain for ages, are rapidly, before our eyes, turning into plaster of Paris and Epsom salts. Probably some of the evil might be avoided. The finest buildings in London appear less handsome than flimsy structures in many continental cities. With us, the peculiarity of the climate is a great enemy. On certain days the acids rise rapidly; but, as a rule, they fall. Great extremes of dryness and of rain are the best protectives, and, during heavy showers, the air of Manchester is not unpleasant to breathe, because the sulphur

is carried down on the rain. One of the foremost printers of Lancashire told me that there were some colours which he found almost instantly to fade. They were frequently sent back upon his hands. He was annoyed to find that the French sent the same colours to the same markets without the risk of having them returned, and it was only after much time and loss that he found that the goods must not be allowed to pass through Manchester. One day was enough, but in some weather two hours were sufficient for their deterioration. The only sure mode we know of diminishing the amount of acid given out by chimneys is by burning no sulphur. This can be done, perhaps, to some extent, by burning less coal, and burning it more economically; next, by not allowing the most sulphurous of the coals to be burnt in large towns. This latter is a simple mode of doing some good, and cannot in all cases be considered too great a demand on manufacturers. Dr. Smith would not speak of the means of burning smoke, which some years ago numbered twelve dozen. It would be a cause of great gratification if the movement began with an association of manufacturers. Municipal bodies had failed to produce any important reform. We must remember that we could not live without rendering the air impure, and, rich as the country might be, we could not afford to destroy our manufactures in order to preserve the beauty of our fields. In such cases there must be compromise. We should oftener arrive at the truth if these questions were considered from wider points of view.

Professor CRACE CALVERT, F.R.S., read a paper on the same subject. Dr. Calvert said:—The action of the products of the distillation of coal upon vegetation varies a great deal according to the circumstances under which they have been produced; thus, the products of the perfect combustion of coals may be represented by carbonic acid and water with small quantities of nitrogen and sulphurous acid, all of which are invisible gases, having no action on vegetation except sulphurous acid. But if coals are introduced into a gas retort and heat applied the products given off are numerous, chemists having already isolated and characterised more than 30 distinct substances, many of which are most destructive to both animal and vegetable life, being highly poisonous when administered in even minute quantities; therefore, the products obtainable from coals vary enormously according to the circumstances under which they are produced. The above statement will enable us better to understand what is commonly called "smoke," and the reasons why it varies so considerably in composition. Thus the smoke issuing from the chimneys of private dwellings may be considered on the whole as belonging to the class where perfect combustion occurs, for the gases, as they emerge from the chimney, carry with them only carbonic acid, carbonic oxide, and sulphurous acid, and a small quantity of the most volatile hydro-carbons which are given off, and this only takes place at the time and shortly after the coals are freshly added to the fire; the less volatile products being condensed in the flue of the chimney, forming what is called soot; but as soon as the volatile products (which are characterised by burning with flame when coals are put on the fire at first) are consumed, the carbonaceous mass which remains in the fireplace may be considered as undergoing perfect combustion, and emitting, as stated above, only gases, having little or no action on vegetation or man, more especially when they become diffused in the atmosphere. But the results of burning coals under the steam boilers employed in our large factories are very different.

1st. Because coals are constantly being added to the mass in combustion. There is not, consequently, that cessation of the distillation of tarry products above stated, as taking place in the fireplace of private dwellings, and it follows that the products of perfect combustion, which are generated near the grates of the fireplaces in factory furnaces, are constantly mixed with a considerable quantity of tarry substances produced by the distillation of the coals, and therefore through their imperfect combustion.

2nd. As stated above, in the chimneys of our dwellings, the draught is such as to permit many of the imperfect products of combustion, or most of the tarry products, to condense, whilst in the tall chimneys erected in our factories the draught is such as to carry out from them the above noxious volatile products; and as many of them will easily condense into liquids and solids when they come into contact with a cold atmosphere, they cannot diffuse nor be carried far before they fall upon plants and other bodies existing in the neighbourhood of such chimneys, and as many of the tarry products are highly poisonous to plants, they affect vegetation in a very marked manner.

3rd. "Black smoke" is a mixture of the products of the imperfect combustion of coal with carbon in a high state of division; the solid particles of carbon when floating in the atmosphere become, like all solids, centres of attraction for fluids, and thereby assist in the condensation of the liquid and poisonous products above mentioned, and help to carry and fix them on the surrounding vegetation, which is characterised by a deposit of such products upon the surface of the leaves and bark of plants, which prevents that free contact with the elements of the atmosphere which is so essential to their health and growth; for, as you are aware, plants absorb carbonic acid from the atmosphere from which their carbon is derived, and they reject oxygen and watery vapour. Further, the intensity of these actions is in exact ratio with the intensity of light, and when "black smoke" is produced in large quantities it interferes with the rays of light arriving on the surface of the earth, and thereby affects vegetation materially. It appears to me that the above facts give an explanation of the activity of vegetation observed in London as compared with that witnessed in Manchester, Leeds, Sheffield, Birmingham, &c. I am well aware that the vegetation in these towns may be slightly affected by the large proportion of sulphurous acid which the smoke issuing from the factory chimneys contains as compared with the quantity of sulphurous acid produced by the consumption of a better class of coal in London, but sulphurous acid, like all gases, has such a high diffusive power, and the mass of air with which it mingles is so considerable, owing to the high temperature at which it leaves the top of the high chimneys, that, although it may somewhat affect vegetation, still I consider its action is comparatively small in proportion to the injury effected by the fixation of "black smoke" upon plants, &c., as described above. As to the comfort which the inhabitants of our large manufacturing towns would derive from the perfect combustion of the fuel in our large mills, works, &c., no one can venture to say; at all events, as a matter of health and comfort, an opinion can be formed by comparing the state of the atmosphere in large towns like Manchester on Sunday as compared with that which is witnessed on the other days of the week. It is hardly necessary to add that it is on record in evidence before a Committee of the House of Commons that manufacturers can effect a saving of 15 or 20 per cent. by burning their smoke, and it is most painful to reflect that after the weighty evidence which has been adduced by many of the leading manufacturers of Manchester, such as Messrs. Bazley, J. Whitworth, Henry Houldsworth, &c., before a Committee of the House of Commons some twenty years ago, we should still live in such a noisome, unsightly, and unwholesome atmosphere as that of this city; and lastly, to witness how Acts of Parliament are put on one side, when they are to be carried and enforced by local authorities who are in such cases the offenders, and at the same time the authorities called upon to inflict fines and punishment.

MR. PETER SPENCE, F.C.S., read a paper on the same subject, in the course of which he said the black smoke of our manufacturing operations is, as one would

naturally imagine from the continual outcry made against it, the worst form of the evil; that in fact it is, all things considered, in a sanitary point of view, an evil at all, I am here to deny; and as I have for years made this a subject of thought and investigation, I think I shall be able to substantiate my opinion. If, in getting rid of black or visible smoke, we were at the same time to get rid of the products of combustion altogether, no doubt the advantage would be great; but if we only increase the quantity and intensify the power for evil of the invisible substances produced, the benefit is not apparent; and if by getting rid of visible smoke we merely get rid of a body not only inert for evil, but in other circumstances fully allowed to be a body of a health-producing character, then we not only do no good, we do positive harm. The facts are decidedly in the inverse ratio of the theory of the sanitary smoke consumers, but harmonise completely with what I believe to be a true theory, founded on a consideration of the nature and ordinary effects of the body with which we are dealing. Would it not be well, therefore, for our sanitary friends to leave this matter to the economist? While we have nothing to gain on the score of health by consuming our smoke, and may have something to lose, we have much to gain in the economy of our fuel.

Mr. Handsel Griffiths contributed a paper, read by Captain Clode, one of the secretaries. Mr. Griffiths proposed, as a practical remedy, that the large chimneys of manufactories should be supplied with five or six diaphragms of wire gauze, the lowest to be easily removable, and to be placed at so great a distance from the furnace that the heat should not affect it. The second diaphragm was to be also removable, as, indeed, all of them, for the purpose of cleaning.

A very interesting discussion followed, in summing up which the Chairman said, that the extinction of the smoke nuisance on the rivers in London was due to Lord Palmerston, who, when a deputation waited upon him and said it was impossible to stop the smoke, said he would show them how to do it. They had now a Prime Minister who had begun in a somewhat similar way to deal with chimney nuisances; and he did not think that it was a glory of which Lord Derby would have occasion to be ashamed, if he delivered Lancashire from the pest of smoke.

THE TEACHING OF NATURAL SCIENCE.

The following is an abstract of a paper read before the Social Science Congress by Mr. John Angell, of the Manchester Mechanics' Institution, on Tuesday, October 9th:—

The author laid down the principle that the teaching of natural science should form a leading and fundamental part of juvenile education on the following considerations:—1. Because of its relation to the structure and organisation of the human mind. 2. Because it supplies that knowledge upon which human well-being, to be secure, must be based. 3. Because its proper study constitutes the best juvenile training for the actual business and duties of life; that is, it forms the best instrument for cultivating and strengthening the observing and judging faculties, upon the power and efficient operation of which mainly depends our progress in life. 4. Because it puts us into practical possession of the natural forces, the proper application of which supplies us with that abundance of the physical means of well-being which is absolutely necessary to the cultivation of our higher nature, constituting, in fact, a means by which the lower forces of heat, light, electricity, and chemical and mechanical force are transmuted into the higher form of mental force. 5. Because it puts us into possession of that comparative superabundance of the personal means of physical well-being and of leisure which are necessary for the elevation of the feeble and depraved among our own civilised race, and to the civilisation of the savage or barbarous races, that is, to the successful accomplishment of the true objects of philanthropic missionary enterprise. 6. Because it tends eminently to enlarge and liberalise the mind, to give it faith in the power of truth, and in the moral government of the universe, even in little things, and in the ultimate progress of the human race. 7. Because natural science is God's own exposition (revealed to us through the researches of the human mind) of the powers and agencies by which He regulates His providence in this world. In regard to the first point, he argued that the structure, organisation, and qualities of the human mind bear a similar relation to the forces which regulate the physical, intellectual, and moral world, that the bodily structure and organisation of one of the lower animals bear to its particular habitat in this world, and that intellectual and moral education, in its large and philosophical sense, consists in the conversion, under the influence of that divine gift, the human soul, of the various physical forces, including heat, light, electricity, and chemical and mechanical force, into the higher forms of vital, nervous, intellectual, and moral force. The fourth proposition he illustrated by showing the evil effects of sparse diet upon both the mind and the body, and the advantages to health, intellectual and physical well-being, which accrued from the application of natural science. History recorded no instance in which a people, permanently ignorant and destitute, had proved virtuous and happy. It was the duty of science to discover and invent, and that of commerce to multiply and diffuse, the gifts of science among mankind. The question arose, what branches of natural science should be most especially taught, and how? The three branches of science whose immediate training and practical value were the greatest were, in his opinion, chemistry, animal physiology, and social economy. On the data furnished by the two latter sciences might also very easily be taught or established a system of moral philosophy, which would do much to implant in the youthful mind an intelligent conviction that a selfish, untruthful, immoral, or sensual course of life cannot, under any circumstances, prove to be of real profit to the individual, or conserve his ultimate happiness, however powerful or influential he may become. In regard to chemistry he urged that the proper way to teach it was not by books, but by introducing the chemical bodies to the notice of the pupils, and causing them to ascertain by their own observation and express in their own unaided language, the result of such observation. Previous to the performance of each experiment the teacher should see that the pupils had the clearest ideas possible to them at that stage of the proceedings, of the bodies on which, and the apparatus by means of which, he was conducting his experiments. He believed it to be a great mistake to suppose that young children are relatively deficient in reasoning power. The flood of questions with which they meet every new circumstance or phenomenon which is brought before their notice should be sufficient to dispose of this error. He concluded by commending the study of the natural sciences, and the importance of their teaching in juvenile schools, to the attention of those Christian gentlemen and philanthropists who worthily spend most of their lives in endeavouring to mitigate human suffering.

Dr. Lankester eulogised the paper, and warmly advocated the teaching of physiology in schools.

CLIFF'S IMPROVED WHEEL FOR POTTERS.

Mr. John Cliff, of the Imperial Potteries, Lambeth, has brought out an improved wheel for potters. He dispenses with all the straps, drums, breaks, pullies, &c., of the few steam wheels in use, and employs a system of gearing by contact only; the machine occupies less than one-fourth the space now taken up by the present machines, and the boy to turn the wheel is not required. Instead of slackening speed by means of breaks, and

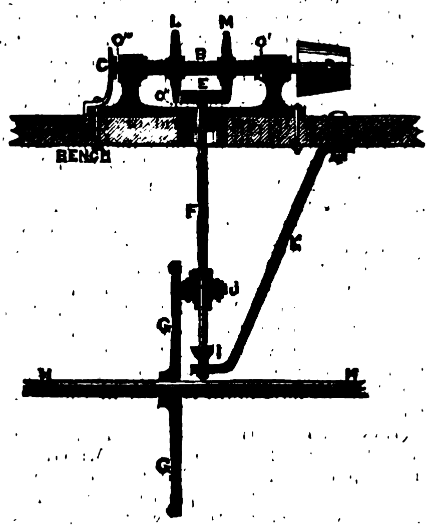
thus losing power, the slackening is gained by the reduction of pressure of G on the disc. The movement of G (by means of the foot lever) through the space of less than ½ inch, secures at the will of the workman, every possible gradation of speed, from the full power of the engine to absolute stoppage. Though the screw shown is deemed the best arrangement, a plain lever is sufficient. When required, the entire machine may, by unscrewing the three legs securing it to the floor, be removed intact. The arm, table, and disc are all cast-iron, the spindle, with its pinion and foot movement, being the only parts requiring skilled mechanism.

Fig. 1.

The following is a description of Fig. 1:—A, wheel box and seat, of galvanized or enamelled cast-iron. B, trident bar-iron legs. C, cast-iron bracket. D, cast-iron disc. E, quick thread lever screw for making contact. G, pinion of leather between iron discs, or wood, or metal. H, steel spindle, with longitudinal groove for the set screw of G to fasten in, and which for various sizes of work to be thrown, may be raised or lowered. The various speeds may be registered on the face of the disc, and the pinion placed there in less than five minutes.

Fig. 2 illustrates the application of the invention to an ordinary lathe. As in the throwing wheel, all ropes, straps, &c., are dispensed with, as well as the treadle-board and wheel, giving a neat and compact arrangement, and securing a large economy, as no boy is required to work the treadle of each lathe, as in ordinary work. In place of the stoppage of the wheel, and reversal of the motion of the rope for polishing clay wares, the workman, with his left arm on a small lever, moves B to the left, causing M to come in contact with the pinion E, which is in constant motion; and to stop, for change of pieces, he allows the spring C to push it back half the distance; while, if the spring is free, it will put L in contact with E, and give a cutting motion. In ordinary work every needful gradation of power is gained by more or less pressure of L or M on E, but in case great varieties of goods are required to be lathed on the same machine, the speed of E may be varied at once by dropping or raising it on the spindle, by means of a set screw; the support K may be placed at any angle, or dispensed with altogether, if the plummer blocks carrying the driving shaft are placed in vertical line with the spindle, the screw-step T being screwed into it. The certainty of the motion, governed at will by the workman himself, seems to promise a greater result of work in a given time, enabling the man also to earn, at given prices, better wages than he can do on the present system. If arranged for a double row of men, the same length of shaft will do, the discs being placed at half the distance as for a single row.

Fig. 2



The following is the description of Fig. 2.—A, is the ordinary lathe head, with under boss to allow of a long shoulder on F. B, cast-iron chuck spindle, with two discs. C, spring to keep at a cutting motion. D, ordinary chuck. E, driving pinion on head of F. F, a steel spindle, with grooves for set screw longitudinally. G, cast-iron disc in one piece, keyed on to H, the driving shaft. I, a screw footstep for F to run in. J, the pinion of wood, leather, or metal, or combined. K, support for spindle. L and M, two discs, either keyed on to B, or cast part of same.

SUGAR PLANTING IN NATAL.

The *Natal Mercury* says:—

Not long ago we were twitted with being presumptuous in venturing to throw out suggestions connected with the practical operations of agriculture. Journalists, we were told, ought to keep within the bounds of politics, or of social economics, and not attempt to treat of subjects which could only be dealt with by experienced men. Were that advice to be followed, we fear that the usefulness of a colonial newspaper would be wholly impaired, and its functions pitifully contracted to those of a mere recorder of events. There is no vehicle of discussion available except the paper. What other way is there of communicating information, or interchanging experience, but that afforded by the paper? We know that our country readers, as a rule, do look to the paper for hints and facts, if not for guidance. They might, it is true, do much to render the newspaper a more useful medium than it is, by sending more abundantly the results of their own observations and experiments. In the absence of these, the journalist has to do the best he can, and if he sometimes propounds strange theories the fault is not altogether his own.

When we say that Sugar-planting and Sugar-making in Natal, however, have to undergo vast changes before they can be considered as having attained even a comparative stage of the degree of excellence which it is possible to attain, we only repeat the oft-expressed opinions of disinterested and practical Mauritian planters. Natal planters are most of them men who began without previous knowledge of the pursuit, and who have acquired from others, from books, or from the hard and plain teachings of their own experience, the knowledge they possess. Under such circumstances it is self-evident that there must be wide scope for improve-

ment. Whether the statements of the observers we refer to are strictly correct, we cannot say, but there must be some ground for them. They say that there is a great waste of resources, that appliances and labour power are not economised as they ought to be; that much more ought to be got in the form of manufactured products, out of the raw material than is got. They admit fully the capabilities of the colony as a sugar-producing country. They admit the special advantages enjoyed by us in respect of cheap food, cheap land, cheap labour, and fine climate. But, say they, we do not make the most of these advantages. In Mauritius, where there is no abundance of land, where the whole of the available area is occupied; where labour and food have all to be imported; where the soil, exhausted by repeated croppings, has to be enriched by costly applications of manure, and where the climate is far more oppressive than ours—in Mauritius, cultivation and manufacture are carried on in a very different way. There mills work night and day, incessantly, until the crop is finished; there the syrup in all its stages is boiled over and over again, until the mere dregs are left for the distiller; there fields are manured, the soil husbanded, and every appearance of a weed abolished; there steps are taken to reduce the cost of transport to the lowest minimum. Such, and many other means, are named by our censorious friends from Mauritius as points wherein they are diligent, and we are lacking. We dare say in some respects they are right. Rome was not built in a day, nor has Mauritius cultivation reached its present state of perfection in ten years. When sugar-planting was as old in the island as it is in Natal, we suspect that it was in no more advanced condition than it is here. When Natal planters have been at work as long as the Mauritius planters, we do not doubt they will be able to tell as good a tale. Still we must not be too proud to learn, for that there must be many shortcomings in our modes of culture, and in our systems of management, is undeniable. Sugar-planting is an art which can only be understood, and properly practised, after a due apprenticeship.

It seems such an important matter to acquire the best information that is forthcoming in connection with the production of our leading staple, that we suggest whether some steps should not be taken by the planters to obtain, in a portable form, the results of the observations of experienced Mauritians. Whether many estates are yet prepared to bear the expense of employing an imported manager we know not, but many such are to be had at a moderate rate of remuneration. Hosts of young creoles could probably be induced to come here were they guaranteed reasonable salaries. Representations made in an authoritative manner through some influential Mauritian channel would succeed in bringing over the class required. These men are born sugar-planters; their childhood and youth have been passed amongst cane-fields and fabrics; they have lived in a saccharine atmosphere, and the pursuit is almost an instinct. We believe that the introduction of such aids would materially promote the development and the profitable working of our estates. Then it would also be possible by combined contributions, to obtain the inspection of a high class Mauritian planter, who might, after visiting the various plantations, and making himself acquainted with the circumstances of the country, place on record the conclusions he had arrived at, and specify recommendations regarding the practical details of the enterprise. If these were printed, every planter, present and to come, might have them in his hand.

Beneath the pressure of the times, and harassed by the monetary difficulties begotten by the late crisis, planters may accustom themselves to the belief that their troubles are all of a financial kind, and can only be met by one species of relief. May we submit that there may be also other ways of guarding and providing for the future? May it not be possible to reduce expenditure, and to increase revenue? Do the estates yield all that it is possible to make them yield? Are their productive powers exerted to the fullest pitch? Could the labour power at command not be made to produce a larger harvest than it does? Progress, we have lately been told in election addresses—progress is the watchword of the age. All things are moving on. Every industry is undergoing improvement. Sugar-planting, too, shares in the onward movement. In times past, with none but imperfect means at hand, our planters did their best, and could do no more. Now that they feel their ground, and that more extended facilities are accessible, it would be a pity if the prospects of a fine industry were to be compromised by any neglect of opportunities.

Fine Arts.

New Purchases: National Gallery.—The last acquisition made by the late Sir Charles Eastlake, supplies one link more in the early historic series which, under the learned director, grew to rare completeness. This recent purchase consists of a "Madonna and Child," by Dalmasio, an archaic master of the Bolognese school, who painted between 1376 and 1410. This artist bore the name Lippo Dalmasio dalle Madonne, because he was chiefly distinguished for his pictures of the Madonna. Mr. Wornum says that he was remarkable for his piety, and his Madonnas were held in such high repute for their sanctity of expression, that a man was not considered rich or completely established who did not possess one of these pictures. It is an example of these much-prized productions, now extremely rare, which is just added to the National Gallery. The picture is signed. The composition represents the Madonna and child seated mid an orb of radiant glory; behind is a blue background or sky, set with a corona of gold stars, occupied by attendant angels. On the foreground are flowers, among which is cast the crescent moon. Another recent purchase is also a picture by another rare and early master, Pietro della Francesca, of whom our Gallery will now contain three examples. The work just added is a single head of a lady in profile; it may have been painted about the middle of the fifteenth century, and resembles the portrait of Isotta da Rimini, the wife of Sigismondo Malatesta. The painter, Pietro della Francesca, received a scientific education, and was one of the first artists who studied the laws of perspective. A third and a fourth purchase are a couple of companion pictures, belonging to the school of Melozzo di Forli, an artist of the second half of the fifteenth century, allied in style to the before-mentioned Francesca. These companion pictures were purchased by the present director from Mr. Spence, of Florence, for £600. Messrs Crowe and Cavalcaselle describe one of the compositions as follows:—Mr. Spence "owns a panel which formerly belonged to Signor Conti, at Florence, and is supposed to have been originally in the sacristy of Urbino Cathedral. A throne is occupied by a female: a small organ lies at her side, to which she points as she presents a book to a youth kneeling in front of her. The figure is supposed to personify the art of music." These trusty historians add that "It is needless perhaps to remind the reader that none of these creations are by Melozzo, but they illustrate the course of a particular form of art in a particular place." Mr. Wornum will, doubtless, in the next edition of the catalogue, further elucidate the subject, and identify the authors of these interesting though comparatively unknown examples of Italian art. The great prize, however, won by the new director is a *chef-d'œuvre* by Rembrandt, "Christ Blessing Little Children." This picture, for which £7,000 has been paid, was thrown into the market by the recent troubles in Germany. From time immemorial it belonged to the Gallery of Schönbrun, in Vienna; subsequently it formed a leading work in the collection of Secrenast

at Aix-la-Chapelle, whence it comes to this country. An etching made while yet the picture was in the hands of the late possessor, was published recently in the April number of the *Gazette des Beaux Arts*. M. Bürger, the chief authority on Rembrandt, writes a critical description of the picture in that journal; and while the article was going through the press he hears, to his astonishment, of the change in ownership; in consequence, he adds a concluding note, to the following effect: "The English, who have a passion for importing all beautiful things, have induced M. Suermondt to cede to them this *chef-d'œuvre* of Rembrandt. What consoles me for this conquest of the English is that at least the picture must always remain visible in a public museum, and will be guarded by very intelligent solicitude." The picture measures seven feet by five feet; it is supposed to have been painted about 1650, but it is without date or name—a strange want in a work by Rembrandt,—and M. Bürger conjectures that the artist's signature may have been painted out, in order to save the picture from the cupidity of the French on their approach to Vienna. The figures are life-size, the style is essentially naturalistic; the colour tertiary, broken and shadowy, and the execution of a rude vigour. Dutch types are dominant, save, perhaps, in the figure of the Saviour, which retains a reminiscence of Italian nobleness. On the opening of the National Gallery, on the 5th November, this work, which ranks in merit with "The Night Watch" at Amsterdam, and the School of Anatomy in the Hague, will be found hung as the centre of thirteen works, which exhibit the early and later styles of Rembrandt with singular completeness.

NATIONAL PORTRAITS EXHIBITION.—A second exhibition, in chronological continuation of the first, will open in the spring of next year. It will commence with portraits of the reign of William and Mary. It is also to include, "as supplementary, the portraits of any distinguished persons who were not duly represented in this year's exhibition." The number of works forthcoming is so considerable that the exhibition may possibly be extended over a third year.

PRIZES AND HONOURS AT THE BRUSSELS EXHIBITION.—The jury has just completed its labours, and announced the prizes awarded to artists contributing to this exhibition. Of the ten gold medals one falls to M. Carrier Belleuse, the French sculptor, and the rest to Belgian artists. The King has conferred a number of decorations on artists. M. Ingres is made Commander of the Order of Leopold, MM. Thomas and J. Stevens, of Paris, M. Robert, of Brussels, and M. Charles Verlat, of Antwerp, Officers; and the following artists Chevaliers of the same order: Messrs. Frith and Stanfield, of London; MM. Daubigny, Charles Jalabert and Schreyer, painters, M. Maillet, sculptor, and M. Auguste Blanchard, engraver, all French artists; MM. Alma Tadema, De Haas, Keelhof, painters; Gustave Simonau, water colour artist and lithographer, and Jacques Wiener, medal engraver, Belgians; and M. Van Muyden, painter, of Geneva. The Exhibition has proved so attractive, that the closing has been adjourned from the eighth to the eighteenth of the present month.

Manufactures.

METALLURGICAL INDUSTRY IN BELGIUM.—The iron works in the district of Charleroi have for this year realised handsome profits, in spite of a slight augmentation in the price of labour, as well as in fuel. Great progress has been made in the manufacture of pig iron. Last year's production may be estimated at about 500,000 tons, of which scarcely 10,000 tons were exported, whilst on the other hand 25,000 tons were imported. Thus, the Belgian pig iron, which formerly served to supply the German and French iron works, is almost entirely used up in its own country. It is not now sufficient even for home consumption; and in general the trade has no cause to be dissatisfied with the reduction of import duties, that are now only 5 francs per ton. All the Belgian pig iron is worked up in the country, and it only goes out in the state of malleable iron. This is of considerable advantage for the blast furnaces, which in this manner are no longer tributaries to foreign markets. This indicates at the same time an extraordinary progress in French trade. Belgium, in 1865, exported 57,000 tons less, and imported 120,000 tons more than in the preceding year. Free trade and the facilities of transport have given an impetus to the mineral districts of France. The situation of the mineral industry of the Charleroi district would leave nothing to be desired if the low price of coal was maintained; but since the end of last year there has been a gradual rise, which begins to press heavily on manufacture. French markets for fuel are only obtainable with an augmentation of 20 to 25 per cent. on those of last year.

ALGERIAN COTTON.—From the recent report of the Marseilles Chamber of Commerce, it appears that France, in 1865, received from Algeria about 4,000 bales of cotton, of a quality such as will readily realize remunerative prices to the grower. The province of Oran produces a long silky cotton, similar to the Sea Island of America, but of greater value, the latter having been sold at 150 fr. the 50 kilogrammes, and Oran at 300 fr., while exceptional parcels found buyers at 550 fr. A remarkable fact in connexion with Oran is that the cotton plant, instead of deteriorating in quality by repeated crops, is much improved by continual culture.

Commerce.

COMMERCE AND PRODUCTIONS OF THE REPUBLICS OF ECUADOR, NEW GRENADA, AND VENEZUELA.—The principal articles of exportation from these states are, tobacco, gold, from the mines of Antioquici, cotton, medicinal bark, coffee, cocoa, woods for dyeing purposes, and hats, called Panama, whether coming from the interior, or from Guayaquil, in Ecuador. The payment for exports is by bills of exchange on London and Paris at 90 days' date. At Paris the exchange is at par, these states having adopted the French decimal system. Amongst the most important commercial towns of the country are Saint Martha, where nearly all foreign imports are landed; Carthagina, from whence is exported all the India rubber obtained from the immense forests of Darien; Savanilla, that exports to London, New York, and Bremen, tobacco, cotton, vegetable ivory, bullock hides, coffee, and yellow woods; lastly, Rio Hacha, that does a great trade in wood and dye stuffs, called *dividivi*. The merchants of this town obtain these products by means of exchange with the Goagizos Indians, and export them to Havre. The value of exportations from these states may be approximately taken at 50,000,000 of francs, and that for importations at about the same sum, France receiving about about 12,000,000 francs as her share.

THE FLAX CROP IN ANTRIM.—Mr. A. Gordon, of Cushendun Mills, Larne, in a communication read before the Chemico-Agricultural Society of Ulster, says:—"In compliance with your request, I submit you a few statements relative to the flax crop in the Glens of Antrim. My observations apply only to three of the glens of Antrim,—Glendun, Glenarm, and Glenariff. The soil of these glens is light, sandy, and poor; and in Glendun and Glenarm mica enters largely into its composition in some parts, and where there is a depth of earth of this kind I have seen it produce good crops of flax, especially in a wet season. In the immediate neighbourhood of Cushendun there is a small track of rich alluvial land, where patches of flax are cultivated that would bear comparison with that grown in any other part of the North of Ireland, if it were only treated with the same skill in the cultivation and after management that it in

is in the County Down and some other places. Last year I saw flax grow for the third consecutive season on the same lands without manure of one sort or other. The crop had a good appearance while growing—the yield was about four stones to the peck; but the fibre was greatly inferior in quality to that of the two former years. I state this fact more to show the ignorance that prevails in the science of agriculture, and that adherence to a mere mechanical drudgery and barren formula of traditional precepts, handed down from father to son, rather than to illustrate the flax-growing qualities of the soil. The above observations apply only to Glendun and Glenarm, for Glenariff is as much superior in soil and cultivation as it is in the grandeur of its scenery over the two adjoining glens. The soil of this glen is formed from the debris of the crumbling basaltic rocks that rise, terrace-like, to the height of 1,000 feet or upwards, on either side, and immediately over the limestone stratum. The glen is much better adapted to the cultivation of the flax crop than either of the other two, as the soil in general is richer, and of greater depth. Flax is becoming pretty extensively cultivated in this glen of late years, and is taking the place of the cereal crops, as it is found to be a better paying one. Though some excellent flax is raised on the alluvial lands near the sea, and in the hollow of the glens, that might still be much improved; yet, in general, these glens are unsuitable for an extensive cultivation of this crop, as the lower grounds are of comparatively small extent, and the higher grounds are very poor, light, and deficient in vegetable matter. But besides the poverty and lightness of the soil, there are other obstacles in the way of the successful cultivation of the flax crop in these parts, and that is, the waters. These waters I have found near their sources yield a Prussian blue precipitate with ferrocyanide of potassium. This, I presume, was owing to the presence of a carbonate of the protoxyde of iron in these waters. I strongly suspected the presence of gallic and tannic acids in some of these waters, but was unable to satisfy myself on this point. The flax steeped in these waters I have found invariably hard and dry in the fibre, when dressed, and wanting that soft, silky feel and rich appearance possessed by some flax. I hold the opinion that a knowledge of the chemical ingredients held in solution by waters intended for flax retting, together with a knowledge of those reagents necessary to counteract their injurious influence on the flax, would be of the utmost importance to flax-growers. Some waters, for instance, may contain a carbonate of lime in preponderance over other mineral matters, or it may be an oxide of iron, or perhaps a tannic acid, or some other substance injurious to the retting of the flax. Now, I hold that were the farmers or flax-growers of Ireland in possession of a knowledge of the deleterious matters contained in the waters to which they submit their flax for the purpose of retting, together with the means of treating those matters with the same skill that the physician does his patient, by checking the disease either temporarily or completely removing it, they would then be able more fully to develop the resources of the country in this branch of its staple manufacture, and be in a position to compete with any other country in the cultivation of the flax crop. I am also of opinion that the injurious matters contained in many waters might be neutralized to a great extent, if not altogether removed, by collecting those waters in the steep pond for six or eight weeks before the retting season commences, and by supplying caustic alkalis to the water in the pond a short time prior to putting in the flax to steep. The alkalis, I should think, would have a tendency to soften the waters, promote fermentation, and neutralize any protoxides of iron present. Should Léfébure's system of retting be committed to the public, and should it prove efficacious in every locality where practised, it will certainly be a great boon to every flax-growing country. But may not his system prove most satisfactory in one locality and quite the contrary in another, owing to the different qualities of the waters used in retting in different localities? I am unable to state the acreage of the flax crop sown in the Glens, but I believe it is fully one-fifth less than last year, and looks very much worse than it did at this season last year. The general impression is that it will be very little worth here this season, unless there be a plentiful supply of rain immediately. The long drought has almost scorched the young plants out of root. The recent showers have, however, improved the appearance of the crop very much.

Colonies.

THE IMPORT AND EXPORT TRADE OF MELBOURNE was, in 1851, valued at £25,000,000, but has increased to £28,000,000 in 1864, wool having increased in that period from £734,000 to £3,280,000. The number of cattle in 1851 was 378,000, sheep 6,000,000, the former of which has increased to about 7,000,000 and the latter to 70,000,000. The total area of land under cultivation in 1851 was 52,340 acres, and had increased in 1864 to 507,798 acres. The public revenue has increased from £400,000 in 1851 to an average of £3,000,000.

LAND IN NEW SOUTH WALES.—The periodical report submitted to the Colonial Parliament by the President of the Board of Lands and Works, shows the change of the occupation of the soil in the colony. Before the Land Act was passed, in 1860, the area alienated comprised 3,944,239 acres, and produced £9,049,131, or an average of £1 9s. per acre. Under the Act of 1860 the selections of country lands extended to 410,600 acres, and averaged £1 0s. 11d. per acre, and 387,642 acres purchased at auction of country lands at an average price of £1 3s. 6d. Under the Duffy Act 701,322 acres were sold at £1 per acre; 661,921 acres were leased to individuals, and 59,992 acres were leased to certificate holders. Under the Amending Act of 1865, 1,827,[illegible] acres were let on lease, the average size of the lots taken being about 230 acres. The result is that 778,278 acres have been alienated, and the greater portion taken, since 1860. On the 1st of January, 1866, 1,342,523 acres were open for selection.

QUEENSLAND.—"This colony," says a Brisbane journal, "differs from those of New South Wales, Victoria, and South Australia. The two first have gold-fields upon which they can rely for a certain amount of revenue, and the latter has the Burra-burra copper mines and large agricultural crops. Queensland has hitherto been merely a settlement for squatters, notwithstanding that Government have expended a large amount of money in trying to induce immigration. Last season, although considered by many unfavourable, was the reverse as regards the sugar and cotton cultivation. The crops of the latter were larger than during any previous year, and the samples sent to the local exhibition were themselves a proof of the suitability of this climate, and of the Queensland soil to its growth, and of the favourable prospects which have been realised; and there are many other resources which only require development. Four very important public works have been commenced, all of which are progressing favourably, viz., the dredging of the flats in the river Brisbane; the dredging of the same river near Redbank; the dredging of the river Fitzroy; and the construction of a jetty at Port [illegible]. The remainder of the timber has left Brisbane, and the undertaking is expected to be finished shortly."

NEW ZEALAND COALFIELDS.—The Nelson coalfields are beginning to grow into importance. At the Grey River the demand exceeds the supply, as all the [illegible] engaged in the local trade of the West coast prefer the fuel to any other that can be procured from Australia. The coalfields at West Wanganui are about to be worked by a company, the coal having been [illegible] tried for steam purposes. Cargoes of this coal are now regularly brought to Nelson, and meet with a ready sale

Obituary.

IERMANN GOLDSCHMIDT, well known for his astro-nical discoveries, died on the 29th of August, at Fon-iebleau. He passed many years of his life in Paris, l gained reputation as a painter of classic and historic jects. Possessed of limited means, he stamped his ie on the rolls of science by his eminent perseverance. was the son of a merchant, and was born at Frankfort-the-Maine, June 17, 1802. His early years were sed in his father's commercial establishment, but a t to Holland, when he was thirty years of age, led to devoting himself to painting, which art he studied h much assiduity under Schnorr and Cornelius. In 6 he proceeded to Paris, which he made his home, where he produced a number of fine works. His ure of "Romeo and Juliet" was purchased by the state, at the annual exhibitions he gained several prizes. ilst thus engaged he prosecuted astronomical studies made a reputation amongst men of science by his ierous discoveries and mathematical calculations. nt 1847 his attention was accidentally turned to onomical subjects, which he eventually adopted with it ardour, and the fruits of his researches include the overy of thirteen minor planets, the list commencing h Lutetia, on the 15th November, 1852, and ending i Panopea, on May 5th, 1861. For these discoveries Royal Astronomical Society in 1862 awarded him r gold medal. He obtained many prizes and other ours from the Academy of Sciences at Paris and r scientific bodies, who recognised the value of energetic labours, carried on with very humble iratus on the sixth floor of the Café Procope. ong these must not be omitted the observation of it 3,000 stars not marked in the charts published by Academy of Berlin, with the concurrence of the t eminent astronomers of Germany.

Publications Issued.

IFE OF WEDGWOOD. By Eliza Meteyard. (*Hurst Blackett.*) Vol. II.—Miss Meteyard, with the pub-ion of the second volume of "The Life and Works Vedgwood," completes a work to which she has ited more than ten years. The second volume, both s text and illustrations, sustains the character won he first. It may be useful to give notice that informa-is solicited as to any Wedgwood ware not yet known, cially "choice specimens of encaustic painted on k bas-relief vases," or "fine specimens of enamelled il ware." Miss Meteyard suggests further appli-n of terra cotta ornaments and bas-reliefs to the ration of "the façades and other parts of houses and lings." She quotes the fact that Wedgwood avoured to induce the brothers Adam, who built Adelphi, and Sir William Chambers, the architect omerset-house, to introduce encaustic plaques into designs. Such a custom, it is known, prevailed before the time of Luca della Robbia, in Italy: recorded that crusaders coming from Italy caused s and dishes, brought as spoils from the East, to be ted in the pediments of Romanesque churches. authoress desires that "wall linings of terra cotta ld do away with" what she is pleased to call "the arous taste of the paper-hanger and upholsterer; and s of exquisite tile work would serve to border the i-embracing carpet." The second volume ends an engraving and some account of the "Wedgwood tute," at Burslem, now in course of erection. In façade the ceramic arts are boldly used for decora-The windows, doorways, cornices, and walls will ve colour and detail from the art manufactures for h the Potteries have been so long famous. A frieze caustic pictures will set forth the various processes of ceramic manufactures. Portraits of Wedgwood's dis-tinguished friends and contemporaries, as also of cele-brated potters of every age, painted in Majolica colours on large plaques, will fill the spaces of the arched window heads, and over the chief entrance panels in jasper ware will be introduced.

Forthcoming Publications.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—Nottingham Meeting, August, 1866. Edited by William Tindal Robertson, Esq., M.D. (*Hard-wicke*).—This publication will contain a full and au-thentic report of the Proceedings of the British Associa-tion for the Advancement of Science, on the occasion of the meeting at Nottingham in August, 1866. It is under-stood that great care has been taken to ensure correct reports both of the papers and the discussions, and as far as possible the editor has succeeded in obtaining the assistance of the authors in correcting the reports.

Notes.

A NEW BELT FOR SOLDIERS. — M. Heeremans, a Belgian, has invented a belt for soldiers, which de-serves the attention of all interested in military affairs. After an engagement or battle, an idea may be formed of the miserable position of the wounded, who, without timely care and dressing for their wounds, often perish without succour, or from the heats or colds that bring on gangrene. The belt is buckled on as an ordinary belt; it is 1·30 m. in length by 8 centimetres in width. It is lined outside, so as to receive a band of dress-ing of the same length, which is readily drawn out. Close to the buckle are two india-rubber pockets, containing, firstly, a bandage for a second wound; secondly, lint, plaster, pins, &c. The soldier wears it on his trousers, and the total weight does not exceed 150 grammes, or about 5 ounces. In many cases the soldier would be enabled to dress his own wounds or those of his wounded comrades. Once the wound dressed, which might occupy two minutes, the belt may be used as a great bandage, whether the wound be in the body or leg; if in the arm it serves as a sling. This belt, of so slight a weight, and at a price not exceeding a franc, does not impede the movements of the soldier.

SECONDARY SPECIAL EDUCATION IN FRANCE.—This im-portant branch of education seems to be gaining ground daily. The Academic Council of Strasbourg, in June last, proposed that a certain number of colleges, which ex-hausted their strength and the resources of the communes in giving imperfect classical education should be converted into establishments for special education. The number of *bourses* (exhibitions) voted by the Conseils-Généraux of the departments in the year 1865, for the new special normal school at Cluny, was 53; this year the number has already reached 72 in the seventy-six councils whose reports have been rendered to the government, so that, with the donations of the Emperor and the central autho-rities, and pupils whose fees will be paid by their families or friends, the normal school of Cluny will at once assume an important character, and doubtless contribute greatly to the dissemination of sound practical profes-sional training. The college attached to the normal school promises equally well; the eastern and northern railway companies have each created six exhibitions for the children of the employés, and there are already twenty-five candidates for the six exhibitions of the former com-pany. The session of the school and college opens in October. The classic Lycée of Mont de Marsan, at another extremity of France, is being transformed into a model school for special training, and the number of pupils entered under the new regulations already

amounts to more than 130, and many more are expected to join before the opening of the session. The professors of this new model school are already appointed, the scientific collections are being enriched by presents from the museum of the veterinary school at Alfort, from the principal establishments in the capital and the departments, and from private individuals. The Minister of Public Instruction was to preside at the opening of this school.

State of Greece.—The Marquis de Moustier, the new French Foreign Minister, during a recent stay of a few days at Athens, had an interview with M. Bulgaris, President of the Council of Ministers, at which, while explaining the policy of the Emperor in the East, he observed that Greece had not hitherto justified the expectations of Europe, and that her resources were quite undeveloped. M. Bulgaris replied that Greece was unjustly accused of not having followed the path of progress, and that at the termination of the terrible struggle to which she owed her independence, and which lasted no less than nine years, she remained devastated, ruined, and exhausted. In thirty-six years the Greeks had been able to build considerable cities, clear and cultivate the land, and create a mercantile navy, enjoying the best reputation. During the same period her population had doubled. The Greeks also had made rapid progress in letters, and nearly everybody in Greece could read and write. The Greek merchants held the first rank in the commercial cities of the world, and that by reason of the honesty of their dealings. In a word, said M. Bulgaris, few countries show such considerable and rapid progress as Greece. The country was burdened at its birth with a considerable loan, of which ten millions alone entered the country; and from this reason, as well as the poorness of the revenue, Greece had not been able to make roads. The unsatisfactory state of her finances was solely due to the last revolution, and was not, after all, desperate.

Enterprise in California.—A company has been formed in California for the purpose of digging a tunnel in the Sierra Nevada mountains, and through it conveying the clear waters of Lake Tahoe to the channel of a stream, and so across the valleys to San Francisco. It is designed thus to supply a dozen interior towns as well as the larger city with delicious water of great purity, provide the miners with water for carrying on their work during the dry season, and irrigate thousands of acres of land that are now unproductive. The difficulty of the undertaking will be comprehended when it is remembered that the lake is fifteen hundred feet higher than any body of water on earth ever navigated by a steamboat. Col. A. H. Von Schmidt is the engineer by whom the undertaking is to be executed.

The Special Normal School of Cluny.—This excellent new establishment, which opens its door this month, is receiving the support of all the friends of education; M. Milne Edwards, the well-known professor of zoology and naturalist, has just presented to the museum of the school his valuable palæontological collection, which includes between three and four thousand specimens, classified and arranged chronologically by the learned professor. A more valuable aid in the study and explanation of geology than this collection of fossil remains, could scarcely have been presented to the new normal school.

Telegraphic Progress in France.—The diminution of the charges for telegraphic messages in Paris as well as in other parts of France and the Continent has produced an enormous increase in the number of messages, and the increase is still growing. The director-general of telegraphs just published the report of the first five months of the present year, and each month exhibits a large increase as compared with the same month of last year. May shows the largest increase, the receipts having been only 436,577 francs in 1865, and 586,332 francs in the present year, an increase of 150,000, or more than one-third in twelve months.

Patents.

From Commissioners of Patents' Journal, October 12th.

Grants of Provisional Protection.

Artificial fuel—2449—A. F. Stoddard.
Boots, &c., elastic waists for—2363—E. Wall.
Breaks—2435—S. R. Freeman and A. Grundy.
Chronometers—2447—I. Hermann.
Compressed air engines—2377—A. B. B. von Rathen.
Corn, drying—2433—G. Dyson.
Cotton gins, self-acting feeding apparatus for—2441—T. Brace and W. Savory.
Cotton, packing—2437—J. T. Wood.
Cotton, &c., twisting—2324—P. J. Railton and D. Walton.
Cylinders—2061—G. W. Rendel.
Fabrics, waterproofing—2443—J. R. Johnson and F. Gale.
Fibrous materials, carding—2481—H. A. Bonneville.
Fibrous matters, preparing—2431—J. Clark.
Fire-arms, breech-loading—2417—H. Carter and G. H. Edwards.
Fluid, employing the motive power of jets of—2489—M. P. W. Boulton.
Fluids, burning—2471—H. Starr.
Fuel—2473—J. Hamilton.
Hats—2299—J. H. Johnson.
Lace machinery—2461—C. E. Brooman.
Leather goods, cleaning—2429—T. Challinor.
Letters, &c., collecting and delivering—2491—W. Clark.
Liquids, filtering—2451—W. E. Newton.
Looms, picker motions for—2427—W. Clark.
Looped fabrics—2221—H. Carrier and W. V. Copeland.
Metal-founders' blacking—2479—J. O. Sellars.
Metallic ores, smelting—2413—C. W. Siemens.
Overshoes—2475—A. H. Thurgar.
Railway tickets, printing dates on—2455—G. Adams.
Rudders—1498—F. Hewitt.
Scythes—2439—J. G. C. Fussell and W. Wise, jun.
Service pipes, preventing waste of water from—2457—J. Chandler.
Stiles—2437—G. Thring.
Substances, drying—2453—R. Kuntsmann.
Taps—2485—J. H. Johnson.
Tarred ropes, untwisting—2459—W. Hunter.
Thatch—2419—G. O. Gooday.
Types, machines for setting and distributing—2425—W. Clark.
Umbrellas—2411—F. Sutherland.
Vertical shafts, lubricating—2421—J. Marsh.
Woven fabrics, printing and folding—2463—J. Barker.
Yarns, elevating—2465—A. Steven.

Inventions with Complete Specifications Filed.

File-cutting machinery—2549—W. R. Lake.
Files and rasps, cutting—2548—W. R. Lake.
Leather binding—2585—G. Haseltine.

Patents Sealed.

844. M., W., A., and J. McNab, jun., J. McAusland, and J. C. Fisher.
1038. W. Bond.
1041. J. J. Bodmer.
1045. W. J. Cunningham.
1047. S. Chatwood & J. Sturgeon.
1049. A. Swan.
1050. T. Brittan.
1052. J., C., L., and M. Jefferson, and J. Greenway.
1055. J. Gresham.
1067. C. Richardson.
1068. R. E. Kaulbach.
1073. J. H. Johnson.
1074. J. H. Johnson.
1092. C. M. Barker.
1109. W. Webb.
1147. R. W. Abbotts.
1203. T. Hutton.
1353. W. C. Moore, J. M. Enlam, and J. Robinson.
2001. S. T. Armstrong.
2166. W. R. Lake.

From Commissioners of Patents' Journal, October 16th.

Patents Sealed.

1071. E. Ash and T. Whitley.
1079. C. E. Brooman.
1080. C. J. B. King.
1084. J. Dickinson, jun.
1086. W. Bullough.
1088. G. White.
1089. R. Puckering.
1093. C. A. Girard & G. de Laire.
1096. E. Lord and R. Norfolk.
1097. J. Holmes & J. C. H. Slack.
1101. E. Wilson.
1102. R. Hamilton.
1106. D. Evans.
1114. F. E. Woller.
1123. W. Brookes.
1128. J. Macintosh & W. Boggs.
1152. R. Thompson.
1155. E. Burle.
1212. J. C. Pearce.
1297. A. Pocheron.
1876. F. Tolhausen.

Patents on which the Stamp Duty of £50 has been Paid.

2490. J. W. Goundry.
2506. J. Dodge.
2513. J. Fowler.
2551. F. de Wyldé.
2493. P. R. Jackson.
2503. R. Aitken.
2511. T. C. Craven.
2497. W. T. Bury.
2507. G. Morgan.
2520. W. J. Rideout.
2555. A. Budenberg.
2564. J. Vaughan.
2512. T. Scott.
2526. H. Clayton.
2608. H. Bridson and J. Ainsworth.

Patents on which the Stamp Duty of £100 has been Paid.

2306. C. F. Beyer.
2345. J. Jack.

Journal of the Society of Arts.

FRIDAY, OCTOBER 26, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade*, obtain the highest number of marks, with a certificate, in those subjects respectively.

Proceedings of the Society.

CANTOR LECTURES.

"On the Synthesis and Production of Organic Substances, and the Application which some of them Receive in Manufactures." By Dr. F. Crace Calvert, F.R.S., F.C.S., &c.

Lecture IV.

Delivered on Friday, May 4th.

On the Artificial Production of Aromatic Substances.

It is with pleasure that I am able to announce to you that this lecture is, by the nature of the products upon which I shall have to dwell, one of the most agreeable of this course—the artificial reproduction of aromatic substances.

The artificial production of this class of substances is a subject which must excite interest, for it has reference to many of the perfumes which we use every day for our toilet, and which contribute to the enjoyment we feel when admiring certain flowers. Therefore I shall begin by stating that chemists have produced artificially that fragrant odour which is given off by an all-admired flower, called the lily of the valley, and which perfume is identical with that given off by the small yellow flower of the *Spiræa ulmaria*, which grows and perfumes the banks of streams winding through our valleys, and which aromatic principle chemists have also traced in a most odoriferous bean, the tonka bean. That enhances the interest in the artificial reproduction of this aromatic compound is, that it is derived from a white crystallised substance, called salicine, having a most bitter taste, which is obtained from the bark of the willow or the poplar, trees which are often the companions of the lily of the valley and the *Spiræa ulmaria*. To extract salicine from the bark of the willow or the poplar it is simply necessary to boil it in water, to add a little oxide of lead so as to separate the resinous and other matters in solution, then to concentrate the liquors, when, on cooling, they yield salicine.

Let us now follow the transformations which this substance—which has been employed as a substitute for quinine in cases of intermittent fevers—undergoes to become converted into a product identical with that which characterises the perfume of the lily of the valley, the *Spiræa ulmaria*, and the tonka bean, and which substance has received the name of salicylous acid. To prepare it from the *Spiræa ulmaria*, or the lily of the valley, it is necessary to boil the flowers with a little caustic potash, which unites with the salicylous acid, and in removing that compound from the aqueous solution it is easy to obtain the acid above mentioned. To prepare artificially from salicine, one part of that substance is mixed with one of bi-chromate of potash, 20 of water, and 2½ of sulphuric acid. On heat being applied to the mixture, salicyous acid distils, which, being insoluble in water, is easily separated, and its powerful fragrant odour easily appreciated.

But there is another series of facts connected with this subject to which I desire to call your attention, and which are linked together by the interesting substance salicylous acid. Thus, when this organic compound is heated with potash, it fixes two proportions of oxygen, and becomes transformed into a substance called salicylic acid, which, when liberated from its combination by means of hydro-chloric acid, separates under the form of white and well-defined prismatic crystals, perfectly inodorous, and soluble in water and alcohol. If to this acid we now add wood-naphtha and a little sulphuric acid, they yield, on the application of heat, a most fragrant perfume, which is identical to that imported at the present time in large quantities from America, under the name of essence of winter green, or essence of *gaultheria*, extracted from a small heath plant, or *erica*, which grows wild on the sides of the mountain rocks of New Jersey.

The essence of winter green offers to chemists, and to us this evening, a peculiar interest, owing to the fact that it is a natural ether, that is to say a compound of salicylic acid united with the oxide of methyl; whilst all the other essences and perfumes are hydro-carbons, to many of which I called your attention in my last lecture, as well as to some other hydro-carbons containing in addition a small amount of oxygen. When the discovery was made by Cahour that the essence of *gaultheria* was a natural ether, the chemical world became so excited that they dreamt that they were at once going to reproduce easily every known perfume; and although this has not been realized, still many interesting data have been added to our store of knowledge. As an example I can cite that if the essence of *gaultheria* is heated with caustic baryta, it unfolds itself into carbonic acid and into a substance called anisol, which has a highly pungent odour, and quite different in its properties from that of the substance employed to generate it. On the other hand, if anisic acid, which is easily obtainable from the essence of aniseed, is acted upon in the same way, anisol is also produced, thus showing how closely allied, in a chemical point of view, are the essences of *gaultheria* and aniseed.

Let us proceed to examine together a substance which of late has been much used as medicine, called valerianic acid, and which offers much interest, owing to the various, wide and curious sources from which chemists have been able to extract it. To prepare valerianic acid from the roots of the *Valeriana officinalis*, all that is required is to split the wood into small pieces, to place it with water into a retort, and on heat being applied the water distils, and there floats in it an oily matter, which is valerianic acid, separated easily. This acid can also be obtained by the same process from the guelder rose or water elder, as well as from the repulsive product called oil of porpoise, the odour of which is, in a great measure, due to valerianic acid. It has also been extracted from various classes of cheeses by my learned master, M. Chevreul, who has also traced its presence among the products which result when animal matter is allowed to enter into slow putrefaction.

But what is especially important are the means by which valerianic acid can be artificially produced;

I shall begin by stating that when the essence of camomile is allowed to fall, drop by drop, into melted caustic potash it is oxidised and converted into valerianic acid. Another interesting production of this acid, is one which has been followed of late years in order to obtain it in sufficient quantity to meet the demand which has arisen in consequence of its therapeutic properties, and its employment by medical men, and this is its artificial production from fousel oil, a product which is obtained during the rectification of raw spirits. In fact, it is the entire removal of this substance through distillation that constitutes the art of the rectifier; for by so doing he obtains purer alcohol, which has an agreeable flavour, and which does not injure man but when taken in excess, whilst if it contains the fousel oil, not only is the taste of the alcohol rank and disagreeable, but it appears to have a a peculiar irritating action on the nervous system.

Among the various methods which have been devised for converting fousel oil into valerianic acid, the most effective, I believe, consists in mixing fousel oil with bi-chromate of potash and sulphuric acid, when by the action of the oxygen liberated from the bi-chromate of potash through the action of the sulphuric acid the fousel oil is oxidised and converted into valereanic acid.

As I have called your attention to fousel oil, let me state at once that this substance, which is so repulsive in consequence of its odour, has, notwithstanding, been much employed of late years to manufacture substances used extensively under the name of flavouring essences, that is to say, essences which are employed to impart the flavour of jargonel pears as well as that of apples, to sweet drops, &c.

The first of these essences is produced by mixing together acetate of potash, fousel oil, and sulphuric acid, when the result of the operation is sulphate of potash and acetate of amyl, which compound is, in reality, the essence of the jargonel pear. To prepare that of apples, all that is required is to unite valerianic acid with its derivative the oxide of amyl, producing the valerianate of amyl, or the essence of apple. And allow me to add that the essence of pine apple is a product obtained through the oxidation of olive oil by nitric acid, giving rise to œnanthylic acid, and that when this acid is mixed with alcohol and sulphuric acid, they produce œnanthylic ether, called essence of pine apple. Practice and experience have gradually led to the manufacture of a large variety of these products, most of which are mixtures of various substances obtained through chemical actions, and certainly nothing can be more curious and more instructive than to reflect that such aromatic flavours are derived from products which in reality have most noxious odours, and which are so repulsive in their nature that they are considered mere refuse. It is to Dr. Hoffman that we are indebted for a correct knowledge of the chemical composition of this interesting class of substances.

Permit me to dwell for a few minutes on the artificial production of the essence of lemon, now manufactured in large quantities by the process which I am going to describe, which consists in obtaining it from the essence of turpentine, substances, strange to say, differ one from the other only in the fact that one molecule of turpentine can be unfolded into two of essence of lemon. To effect this splitting (if I may so express myself) of a molecule of turpentine into two of essence of lemon, the turpentine is mixed with alcohol and nitric acid, and the mixture exposed to the rays of the sun, when gradually the turpentine unites with the water, giving rise to hydrate of turpentine; a combination of this substance with six atoms of water, giving birth to large, well-defined crystals, which are separated from the mother liquors in which they have been formed. These crystals, on being submitted to the action of hydrochloric acid, unite with the gas, and give rise to a liquid and a solid substance, which liquid portion, on being acted upon by potassium, gives birth to the essence of lemon. If, instead of operating upon the hydrate of turpentine with hydrochloric gas, we act with it at once on turpentine we shall observe that the gas is absorbed in large quantities, and after a short time a white, solid, crystallised substance will be formed, which on being separated from the fluid in excess, pressed between folds of paper, and then sublimated by gentle heat in a retort, yields a white, crystalline, transparent substance, whose odour is identical to that of natural camphors as they are imported, either from China or the island of Borneo, countries which chiefly supply us with that useful aromatic substance, and which is easily obtained by placing slips of wood belonging to the tribe of plants called *Laurus camphora* with water, in iron shallow vessels, and placing over them metallic cones filled with rice straw. On the application of heat the camphor is vaporised, and becomes condensed under the form of small crystals, which attach themselves to the rice straw, from which they are easily removed, collected, and shipped to this country, where they are introduced in large glass vessels, and which are in their turn placed in heated sand baths, when the camphor volatilises, and is re-condensed on the colder parts of the glass vessels, forming large solid white cakes, so well known to us as refined camphor.

There are few substances in the vegetable kingdom which have excited more interest in the chemist's mind, and have called forth more researches, than a seed, the products of which are extensively used in every-day life, and whose composition is still so little known by the public, I mean the seed of the mustard plant. It is necessary that I should state there is a marked difference between white and black mustards, notwithstanding both of them contain starch and a fatty matter. Thus, when white mustard is mixed with lukewarm water, the elements of the seed appear to undergo no modification; whilst if black mustard seed is placed under similar circumstances a most powerful and pungent odour is produced, arising from the generation of the essential oil of mustard. As this oil is the result of the action of an albuminous ferment, mysorine, on a substance called myronic acid, unfolding it into an essential oil, and that this chemical phenomenon is prevented by a temperature of 212°, it therefore follows that whenever it is desirable to produce this oil, which acts as a powerful caustic on the skin, it is necessary that the temperature of the water with which the mustard is mixed should not exceed 150°, for without this precaution the ferment mysorine is coagulated, the chemical action ceases, the essential oil is not produced, and thus the benefit which might result from the application of such a substance under the form of a poultice is not attained. It is no doubt with a view of avoiding the evil results which often occur when mustard seed is used as a poultice, that of late the essence itself has been patronised by medical men.

Among the numerous transformations which chemists have succeeded in effecting in connection with the essence of mustard, the most interesting is its conversion into essence of garlic, which is most easily effected under the following circumstances, namely, heating essence of mustard with potassium, when a certain amount of carbon, sulphur, and nitrogen are removed, which unite with the potassium to form sulpho-cyanide of potassium, the remaining elements being essence of garlic, which being volatile, is easily diluted.

I cannot do better, as a conclusion of the course, than dwell for a few minutes on the curious relations which exist between indigo and some of the products procured from coal tar; many of them being identical in composition and properties, and are obtainable from both these sources. Thus, if we treat indigotine, which is the colour-giving principle of indigo, with strong nitric acid, we obtain a beautiful yellow crystallised substance, which has received the name of picric or carbo-azotic acid. This acid has a most

intensely bitter taste, and has been applied with marked success of late as a tonic and substitute for sulphate of quinine, a remedy for intermittent fevers. Picric acid possesses the curious property that if taken internally for a short time it communicates its colour to the epidermis of man, and thus gives the appearance of suffering from an attack of jaundice. This discolouration, however, is not permanent, for if the person so discoloured ceases to take it internally, the artificial discolouration disappears, and the skin resumes its natural colour.

There are two facts in connection with this colouration of the tissues of man by carbo-azotic to which I should like to call your attention. First, that the period of time of its absorption varies considerably according to the peculiar constitution of the individual, and the disease under which he is suffering; secondly, that the absorption of this matter carries with it the stamp of its presence by colouring the tissues. Physiologists may therefore avail themselves of it to trace into the human system the absorption and penetration of such medicinal preparations as contain this substance.

If the production of picric acid was entirely dependent upon the conversion of indigo, we should have to consider it as a curiosity, for its price would be so high, being only a by-product of a costly substance. On the contrary, however, it is manufactured artificially by tons for use as a powerful yellow dye, yielding to wool and silk a most splendid yellow hue, rivalled in beauty by no other known dye. To produce this cheap and beautiful colouring matter a coal tar product is used which I have on several occasions mentioned to you, namely, carbolic acid. By acting on that subtance with, nitric acid, three atoms of hydrogen are removed from every molecule of carbolic acid, and on these being replaced by three atoms of hypo-nitric acid, it is converted into picric, which merely requires to be separated from the excess of nitric acid to be ready for use in arts and manufactures. Another curious instance of the connection existing between tar products and those which are derivable from indigo, is the following:—If indigotine be mixed with caustic potash, and heat applied, a peculiar oily matter is produced, well known by name to all of you, for it is aniline, a substance which you are aware gives rise to those splendid tar colours which we so much admire. This substance, of course, as you also well know, is manufactured in large quantities from coal tar products, especially benzine, by a series of transformations which I have had occasion to explain before in this room.

There are several other substances which chemists have succeeded in preparing and isolating, and which multiply still further the relations between indigo and tar products, but as they are for the present purely of scientific interest, I shall not trouble you with them this evening.

I hope I have laid before you, in this course of lectures, a sufficient number of facts to convey to your minds the belief that chemists will be able, within a few years, to reproduce artificially substances which are now rare and costly, and thereby will enable manufacturers to employ with facility substances which by their high price, are now rendered useless. It will also place in the hands of our manufacturers cheap and commercial productions, which will either be identical or a perfect imitation of those which we now employ, and for which we entirely depend upon the climates of foreign countries. Thus, for example, it is highly probable that chemists will be able to produce artificially morphine, quinine, and a variety of other useful therapeutic agents. On the other hand, they will prepare colours equal to if not surpassing in beauty those extracted from natural products, and time will reveal to them means of giving them permanence. We shall then no longer depend upon India, Mexico, South America, or any other part of the world for our colouring matters. In fact, we shall, as we now partially do, supply to those countries the very shades of colour for which formerly we were entirely depending upon their productions abroad to enable us to enter into the world's field of competition.

Proceedings of Institutions.

LANCASHIRE AND CHESHIRE UNION.—The annual meeting of this Union was recently held at the Manchester Mechanics' Institution, THOS. BAZLEY, Esq., M.P., in the chair. At least 100 delegates from the Institutes composing the Union were present. The report of the hon. secretary (Dr. Pankhurst) stated that the number of Institutes now in the Union is 120, of which 11 have been admitted during the past year, while four have, during the same period, ceased to exist. A summary of returns from 82 Institutes shows that the aggregate number of members is 22,780; the income of 71 Institutes has been £24,186; the number of books in the libraries of 72 Institutes is 131,446; number of members attending evening classes at 64 Institutes, 7,342. The influence of class instruction as an agency for the diffusion of information, and as an instrument for submitting the intellectual faculties to discipline at once systematic and sustained, has always been highly valued by the Council. Their policy and views in this respect have been ably and energetically carried out by the visiting agent (Mr. Lawton), whose undiminished devotion to his work they heartily and warmly acknowledge. Under the auspices of the Council examinations have been held during the past year, under the superintendence of the Local Boards. The Elementary Examination was held in March last. A tabular statement of the results shows that while in 1864 there were 72 pupils, and 171 in 1865, there were this year 82 pupils of the higher grade, and 287 of the lower grade, or 369 pupils in all, examined. To the Final Examination of the Society of Arts, in April last, candidates were sent in by 30 Institutes, of which 23 are in direct connection with the Society of Arts. A classified statement of the result shows that while in 1864 the total number of candidates was 34 of the first class, 86 of the second class, and 127 of the third class; and in 1865 there were 56 of the first class, 100 of the second class, and 124 of the third class, there were this year 35 of the first class, 99 of the second class, and 136 of the third. At 32 Institutes, Science classes in connection with the Department of Science and Art have been in operation during the past year. The results of the examination held in May last were as follow:—Of the first class, 56; second, 70; third, 232; fourth, 113; and fifth, 130. In 1865 the results were—first class, 46; second, 118; third, 212; fourth, 226; and fifth, 251. And in 1864 they were—first, 68; second, 91; third, 128; fourth, 148; and fifth, 122. Special attention is directed to the extension of the examination scheme of the Union by the awarding of special prizes. The object of this extension has been to bring under a higher order of stimulus those members of Institutes who have passed successfully through the elementary stages of education. The character of the topics selected as the subjects to be dealt with present two features of significance. They refer directly either to some of the important local branches of production, or to the great relations brought into prominence by the industrial life of these districts. The following is a list of the results for 1866:—Social Economy—Special Examination: First-class Certificate with £1 prize: Burnley Church Literary, 1; New Mills, 1; Hope Chapel Y.M.S., 1; Waterhead, 1.—Essay—Prize, £5, Bredbury M.I. Society.—Strikes, &c., Essay—Prize, £5, Burnley Mechanics'.—Social and Intellectual Elevation—Essay—Prize, £5, Rawtenstall Mechanics'.—Mechanical Drawing (mill-gearing: 1st prize, £5, Bolton; 2nd prize, £1, Oldham

Lyceum.—Needlework and Cutting-out, £5: Divided between Burnley Mechanics', Staleybridge Mechanics' and Freetown (Glossop) Institute. The special prizes for the ensuing year will be for the following subjects:—"Social Economy," given by the Right Hon. W. E. Gladstone, M.P., ; "Biographies from English History," given by Mr. Thomas Ashton; "Improvements in Machinery, &c.," given by Mr. Hugh Mason; "The Influence of Co-operation on the future of the Working Classes," given by R. M. Pankhurst, LL.D.; "Cutting-out and Needlework," given by Mr. R. Rumney, F.C.S.; "Domestic Economy," given by Mr. William Hoyle; "Calculation of Speeds of Wheels, &c.," given by Mr. Councillor D. Morris; "Mechanical Drawing," given by Mr. Councillor Milnes; "The Wages Question," given by Mr. David Chadwick. The subject of instruction in science has continued to receive the earnest attention of the Council. They have endeavoured to organise a system of science-teaching, which should economise the power at present at command, and which should be adapted to the wants of the members of Institutes, in view both of their industrial pursuits and of the exigencies of their daily life. Since the last meeting, the Department of Science and Art have consented to allow payments on results to elementary teachers engaged in teaching Science classes. The council held the usual annual conference of Science secretaries and teachers, at the Mechanics' Institute, Manchester, in August last. The conference, which was well attended, discussed fully the principles and action of the government scheme, and considered suggestions for its modification and extension. Another great subject has received the anxious consideration of the council. Female education has always occupied a place amongst the agencies of the union. During the past year prizes were offered for special work done by female members of Institutes; but, in order that the educational value of the plan might be maintained, the council made it an indispensable condition of competition that the candidate should have passed a satisfactory examination in the elementary branches of instruction. Boxes of the itinerating library have circulated amongst the Institutes. The income of the union has been £337 10s. 8d., inclusive of £259 17s. 6d. from annual subscriptions, £26 from donations, and £43 4s. from subscriptions from Institutes. The expenditure has been £310 10s.; leaving a balance subject to current liabilities of the month, of £27 in favour of the union, and there are unpaid subscriptions to the amount of £10 13s.—Mr. Lawton, the visiting agent, reported that during the past year he had visited 86 Institutes, and delivered 27 lectures and public addresses. Of the 116 Institutes in union last year, three had ceased to exist, and two had been constituted working men's clubs. One only of these had evening classes. Of the 12 Institutes that had joined the union, three had been established during the year; eight had evening classes in operation last winter; 76 of the Institutes visited had classes for elementary instruction, and 30 had female classes. In some of the Institutes the female classes were vigorously conducted. and well appointed. The most numerously attended classes were at Mossley, Oldham, Waterhead, Freetown, Glossop, Staleybridge, and Droylsden. In addition to the special prizes offered by the union, the Society of Arts offers a prize of £2 to female candidates who obtain the highest number of marks in arithmetic, animal physiology, domestic economy, social economy, &c. The scheme of the Department of Science and Art is now generally understood, and, could teachers be secured, arrangements would soon be made to establish classes in all the districts of the union. Several central classes were formed last winter. Convinced that the examination scheme of the union need only to be known to be appreciated, Mr. Lawton arranged in most of the Institutes visited to give to the members of the evening classes a short explanation of the working and advantage of the examinations. As a result, a large number of candidates offered themselves for examination. The attendance of the public at lectures, as a rule, is most disheartening, only twenty or thirty, and in some cases not even that number, attending; but there are some exceptions, and at Bacup the lecture scheme has worked very successfully. At Droylsden a successful course of lectures was given last winter, the interest being sustained throughout. Saturday night entertainments (including readings, recitations, and music) have been remarkably successful at various places. The report concluded with a suggestion that more care should be taken in regard to carrying out the regulations of the Society of Arts in respect to the preliminary examinations.—The Chairman said that he considered the progress made exceedingly satisfactory. He did not wish to measure the time by the days and months which had passed, but by the acts and deeds which had been performed. When he saw 23,000 members in the amalgamated Institutes he thought that it was exceedingly gratifying, for it showed that the cause of education was making rapid progress in this country. After various resolutions of the usual character had been passed, Dr. Pankhurst thanked the meeting for the very kind expression of opinion of the work of the Association which they had given. The operations of the Union had been worked according to a policy, and as the months of the year had rolled round points of the policy had successively invited special attention and regard. In the policy there had been in the past year two prominent features, which had claimed their especial anxiety. One of those things had been science teaching, and the other female education. With reference to science teaching, they had endeavoured to make the utmost possible use of the present Government scheme. The government scheme was, however, limited as to the amount of aid it supplied, as to the class which it was intended to benefit, and, as a whole, the scheme was of a temporary character. The object of the Association had been throughout, in making use of the government scheme, to prepare the way for some suitable and comprehensive plan of teaching science. The other great subject was that of female education, and he thought the policy of the council in this respect ought to be very plainly stated. That plan had hitherto been to train the intellectual faculties of women, as being the best preparation they could give them for the duties and activities which more especially constituted woman's work. The council for the ensuing year was then appointed, after which resolutions asking the council to consider what modifications, extensions, or otherwise, it was expedient to introduce in the government scheme, and also pledging the council to aid the movement for the education of women by preparing a complete scheme of class instruction, and circulating it for the information of secretaries and committees. In the course of the discussion it was stated by Dr. Watts, that one cause for the prevalence of female crime in Lancashire was the early stage at which the females were released from control and acquired an independence of action. It was also suggested that those who had passed the best examination in physics and science should have a session at Owens College. Thanks to the examiners, the directors of the Mechanics' Institute for the use of the room, and to the chairman, were passed, and the conference was brought to a close.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—MORLEY MECHANICS' INSTITUTION.—The annual meeting of this Institution was held on Tuesday under the presidency of the Mayor of Dewsbury (Mr. R. H. Ellis). The report stated that the Institution had now 172 members, being an increase of 28 on the previous year. The classes and reading-room were well attended, but financially the Institution was not yet a success. Addresses were given by the Chairman; Alderman Carter, Leeds. Mr. Henry H. Sales, Yorkshire Union of Institutes, and the Revs. D. C. Nearey, South Ossett; J. Thirkhill, Holbeck; J. Haslam, Gildersome; G. Southey, and J. Dodsworth.

POPULAR RECREATIONS.

Under the head of "Village Concerts," the following letter has been addressed to the *Times*, and it may be interesting to the different educational Institutions in Union with the Society, and afford hints for a similar action elsewhere. If the musical ability of the country were really looked after and properly cultivated, there appears no good reason why every place having a population of 1,500 persons might not, once in the year at least, make arrangements for holding its little musical festival:—

SIR,—If it be difficult to introduce national education—meaning thereby religious instruction, with a *minimum* of reading, writing, and summings—into villages inhabited by fewer than 1,000 persons, as the evidence before Sir John Pakington's Committee has abundantly proved, it is much more so to bring the people of small villages together and give them amusements sufficiently rational and attractive. An experiment to enlist in a musical concert all classes of the inhabitants in a little village has been recently tried, and has had so great success in all ways as to justify me in asking for space in *The Times* to give details with some particularity, which may enable the same thing to be done, where the inhabitants wish it, in other places as unfavourably situate as the scene of this concert.

The village in question, or rather its parish, contains under 1,500 inhabitants, many of whom live among the sand-hills at a distance from the little place, which, although within 30 miles of the metropolis, yield even blackcock to the sportsman, and once on a time gave cover to the Sussex smuggler, before the dawn of free trade. It has a church with architecture beginning with the Normans (I am not sure that a Saxon bit or two might not be found left in the tower), besides offering specimens of all the broad divisions of English architecture down to the days of modern churchwardenism. In addition to a fair school, the present rector, who is removed by two generations from the poaching and smuggling epoch of the parish, has benevolently built an excellent schoolroom for girls, which, on the occasion of this musical festival, was somehow made to hold 209 persons. Without this room, lent and lighted by the rector, the concert would have been a very dwarfed and insignificant affair, as no one dared to propose the use of the church.

The object and organization of the concert were in this wise:—The first object was to bring all the inhabitants of all classes into good fellowship, to give them a pleasurable and purifying excitement more wholesome than a fancy bazaar—that refuge of country places; and, if we paid our way, to divide the profits among the old women of the parish above 70 years of age. For the organization of this undertaking, we succeeded, after some discussions, in making a committee of ladies of the village who were willing to act together. Their special duty was to make the enterprise well known and to invite co-operation. Besides this, they opened their hospitable doors to the non-residents, who were brought from other parts of the world to assist the village talent, and these ladies gave good cheer for three days, including refreshments to the performers at the concert, which were highly appreciated by the village choir. There was an executive of two musical young ladies and a chairman-director. The lord of the manor offered the use of timber for the platform, and directed its construction; a great printer in London contributed the programmes and placards, while a young lady undertook the decorations of the room, with the aid of a juvenile committee of assistants she had constituted, and I cannot tell you how many hundred feet of roses and evergreens were made and suspended from the bare-whitewashed walls, and several *coronæ lucis* of a humble sort, producing an artistic effect which I have never seen surpassed for elegance and simplicity in any ballroom.

The choir was selected from the villagers, who had never before practised any secular choruses. After the first practice of "Mynheer von Dunk," which was highly relished, they were overheard saying, "they would like to stay all night to sing it." For a month or two the chorus was drilled by some lady twice in a week in the evening after their day's toil, and they came through the incessant rain of the last month, night after night, without caring a bit for it. We got together two basses, two tenors, two altos, and two sopranos from the villagers, and supplemented them by some more practised amateur friends of the committee, who also fully entered into the spirit of the work, and oftentimes came miles from the neighbourhood to assist. We collected four very good *seconde donne*, four *tenori* and *alti*, and four *bassi*. The chief difficulty experienced in the musical arrangements consisted in conducting the troupe, and for want of an authoritative musical despot the early practice was rather disheartening. Few amateurs are sufficiently sensible of the importance of looking at musical work as a reality, and they too often think a little flatness or sharpness, or a stumble in time, mispronunciation or inarticulation as of no consequence, and trust to its not being perceived. We had a competitive examination for most of our amateur solo performers; but the judge, not being professional, was a coward, and did not dare to say all he felt. My advice to any who wish to get up a village concert is to seek for a professional conductor at the earliest stage, who is an entire stranger to the neighbourhood, and who will not scruple to give good advice to all who are willing and competent to sing or play. If he be a wise man he will make all necessary allowances for amateur imperfections, and carefully cure them as far as may be possible. Somehow hints for improvement were made to reach our amateurs, who took them with patience and good humour, and at the critical time acquitted themselves creditably, and to the perfect content of the audience. It is not every village concert that could obtain such an amateur accompanyist as we did, and still less such a *prima donna*. When I tell you that besides an Italian and French song and Handel's "Sleep," sung brilliantly, she made many of her audience weep at "My mother bids me bind my hair," "Kathleen O'More," and "Wapping Old Stairs," which was permitted only at the cheap concert, where its pathetic homeliness was felt, and that she was lustily encored in all—amateur musical circles in London will know who this kind lady was—who came and stayed two days to sing for "our old women." It was curious to remark how the village people's faces showed their enjoyment of "*Non piu andrai*" and its tune, without understanding a syllable of the words of it. Our amateur *primo basso*, who had been drilled in Rome, sang it excellently, and was encored. We had been promised the services of perhaps the most rising English composer, but a sudden death in his family prevented his coming. A local amateur musician, very competent, who had agreed to act as vice-conductor, acted for him, and gave all the assistance necessary in this difficult post. Among all the many instances of goodwill it should be recorded that the music-seller of the neighbouring town liberally sent over a grand pianoforte of Broadwood's, while the registrar and stationmaster and the little shops of the village efficiently acted as our Mitchells, and Sams, and Cramers, and Chappells. In all, our choir and performers numbered 35 persons, all being amateurs.

It may furnish suggestions to other places to know what performances, after about four weeks' rehearsal and preparation, we accomplished, so I send you the programme, but without the names of the performers:—

PART I.

Duet,—Violin and Pianoforte	Mozart.
Glee,—"All among the barley"...	E. Stirling.
Songs,—"My mother bids me bind my hair" and "Kathleen O'More"	
Glees,— "Since first I saw your face"	Ford.
Glees,— "Hark, the lark"	Cooke.
Duet,—"Là ci darem" (Don Giovanni)	Mozart.
Solo and Chorus,—"Povera Rondinella"	Campana.
Ballad,—"The Bailiff's Daughter of Islington" ...	

Four-Part Song,—"The Nightingale"	Mendelssohn'
Song,—"Wapping Old Stairs"	
Trio and Chorus,—"Mynheer van Dunk"	Bishop.
PART II.	
Solo and chorus,—"Come, if you dare"	Purcell.
Trio,—"Fior di Aprile"	
Glee,—"See our oars"	Stevenson.
Solo,—Pianoforte	
Quintett,—"Blow, gentle gales"	Bishop.
Song,—"Ouvrez la Porte"	
Trio and Chorus,—"Glorious Apollo"	Webbe.
Trio (Voice, pianoforte, and violin).—"A bird sat on an alder bough"	Spohr.
Song,—"Non più andrai"	Mozart.
Chorus, with solo,—"La Carità"	Rossini.
"God save the Queen."	

We gave two concerts—one at 3 p.m., attended by all the quality, whose numerous carriages created a sensation never before experienced in the village breast, and on the following evening we repeated nearly the same concert at 7 p.m. I am bound to say that our evening meeting was far the more hearty and brilliant. We duly consulted the sensitive feelings of the quality at the first concert in our selections—Handel's "Limpid Streams" was rejected as being sacred music, and even at our evening concert our *primo tenore* apologised for singing the "Maid of Islington," a bailiff's daughter who married a squire's son—a song of dubious morality in a little village.

Our receipts were £18 15s. from the first morning concert, at 2s. 6d. each, and £8 4s. from the second, at 1s. and 6d. (sixpenny admissions proved unnecessary, as the room could have been nearly filled again with shillings), and £1 18s. from programmes, making a total of £28 17s. Our expenses were just under £8, including 5s. paid to the county rates for the services of an efficient constable, and the result has been a donation of a sovereign to each of 21 old women of the parish averaging just above 77 years each, who will thus be enabled to have an additional half ton of coals to warm their old bodies in the winter, besides affording an unusual treat to the villagers, a pleasant gathering of the gentry, a month's useful practice of music, an infusion of some new and not unprofitable ideas, and the promotion of cheerfulness and kindness among the high and low and rich and poor. What has been done in this old Saxon village—which may be found in the Conqueror's survey of Domesday of the county of Surrey—could, I think, be done almost in any other village. The receipt for doing briefly summed up is as follows:—Secure a room to hold a hundred and more people, form a committee to guarantee an expense of five or six pounds, appoint a director with full powers, obtain a professional conductor to select the performers, and appoint his deputy to act in his absence; print some placards to be exhibited in shop windows, name salesmen of the tickets, the number of which will be regulated by the accommodation. Let the chorus be composed of the natives and amateur strangers who are benevolently disposed, have two practices a week for six weeks, and then, if you act zealously and discreetly, and gently and firmly, you will realise a satisfactory concert, and obtain a surplus which can be turned to some useful account. Cathedral towns get up their festivals once in three years, and why not every village in the country?—I am, Sir, your obedient servant, Felix Summerly.

Another writer, signing himself "Duo," says:—

It is now two years nearly since we attempted the first of our concerts, our plan of operations being as nearly as possible that mentioned by Mr. Summerly as regards obtaining the co-operation of the vicar, the use and decoration of the school room, &c. Like him, we were, perhaps, singularly lucky in possessing a *prima donna* of unusual excellence, who moreover boasted the additional advantage of being able to drill and conduct our little musical troupe; and here let me say no "authoritative musical despot" could have been more implicitly obeyed than was our fair conductor. The rehearsals, or practisings, took about three weeks, and the prices of admission to the concerts were fixed at 1s. and 2s.

Our first concert, given on the 30th of December, 1864, was so successful that it was repeated the ensuing evening, the pecuniary result being a net sum of over £15, which enabled the worthy vicar to distribute a blanket to each of his parishioners over 60 years of age.

Emboldened by our success, we repeated the experiment on the 27th and 29th of December, 1865, with yet greater success, and were enabled to supply the neighbouring female poor with warm flannel clothing.

The E—— concerts, we now hope and believe, are an established annual event, and are looked forward to with almost the same certainty and pleasure as Christmas itself.

A third correspondent, "E. V. H.," writes:—

As one who has had some experience in organising and directing such concerts, perhaps I may be allowed to give a few practical hints to those who may wish to try their hand at such undertakings:—

1. I am inclined to believe that the success of these entertainments depends very greatly upon your having or not having a competent accompanyist. A good accompanyist is almost of more importance in these cases than a good conductor. As a general rule ladies do not understand the art of accompanying a large body of voices; they are deficient, with some honourable exceptions, in the nerve, the strength of finger, the energy, and the decision which are required in accompanying a chorus of untrained singers. Even with a fair chorus and a good conductor any unsteadiness in the accompaniment is apt to jeopardise the whole performance, and therefore, I would say, first of all take care to secure a person who thoroughly understands the ins and outs of accompaniment.

2. The difficulties of the preliminary practices will be greatly diminished by each of the four parts—soprani, alti, tenori, bassi—practising separately for the first fortnight, and not being allowed to sing together till each part has thoroughly mastered its music.

3. Written copies of the music should never be used, unless it is absolutely impossible to obtain a printed edition; the former are often full of mistakes, and exceedingly difficult to decipher. It is very important that each performer should have a copy to himself.

4. The pleasure of the audience will be greatly increased by distributing to every person present books of the words of the music. This can be done at no great expense, and contributes much to the success of the concert. I had the pleasure of superintending a concert last Christmas at which some hundreds of poor people were admitted on payment of 3d. each, and we were able, not only to give nearly all of them printed books of the words, which they carried away as mementos of the evening, but also to hand over a handsome balance to certain charities which were greatly in need of help. Let others go and do likewise.

THE PRESERVATION OF GRAIN.

As considerable attention has been given of late to the important subject of the conservation of grain, flour, and biscuit, it will not be amiss to refer to what has taken place in France on the subject. Last year a Commission was appointed by the Imperial Government to inquire into and report upon a method of preservation invented by Dr. Louvel. His system consists in enclosing the grain or other substances in cases deprived of air; and the cylinders which he uses are made of sheet iron, and are provided with a man-hole at the top, a hopper below, and a manomètre to show the amount of vacuum obtained in the usual manner by a common exhausting pump acting on a stop cock. The examination by the commission took place at Vincennes. Three cylinders were

experimented upon, one containing grain, a second flour, and the third sea biscuit; two of these cylinders were set up in a yard without any shelter whatever, and the third within the building, and the object of the commission was to ascertain, first, if fermentation were absolutely prevented, and secondly, if the ravages of insects were entirely prevented. The Commission was composed of Marshal Vaillant; M. Boussingault, of the *Institut*; Dr. Senard, of the Imperial navy; M. Tisserand, manager of the Government agricultural establishments; M. Doisneau, formerly syndic of the bakers of Paris; M. Lecouteaux, agriculturist, a member of the Imperial Society of Agriculture; and M. Borie, editor of the *Echo Agricole*. On the 15th of July, 1864, in presence of the commission, fifty hectolitres of wheat of the first quality were placed in one of the cylinders, together with about twenty litres of lively weevils; the cylinder was then closed, and the air extracted until the pressure was reduced by 65 centimetres. It took eight men during 40 minutes to produce this amount of vacuum. In a second cylinder was enclosed a ton of biscuit half destroyed by insects, and in which living worms and weevils were visible. In the third cylinder was enclosed a ton of fine Paris flour. On the 24th of January, 1865, the cylinders were opened in the presence of the Commission, it having been previously observed that the vacuum had fallen to about 35 centimetres, which was principally attributed to the emission of aqueous vapour caused by the rarefaction of the air during the summer. The grain in the first cylinder was found in a perfect state of preservation. The weevils were completely destroyed, and their carapaces perfectly dry. The insects had been put in alternate layers with the wheat, and the grain with which they had been in contact was perfectly untouched. The wheat was sold in the corn market of Paris afterwards, at the full market price, and a handful of the grain when placed in the ground germinated perfectly. One observation made with respect to this trial was, that grain containing an excess of humidity would, in the apparatus of Dr. Louvel, be brought into proper condition by the mere effect of the vacuum produced, a great advantage in the case of grain harvested in wet weatner.

The biscuits contained in the second cylinder were in the same condition as when enclosed; but all the insects were dead and completely dried up.

The flour was found perfectly good, and bread made from it was declared of first quality.

The opinion of the commission was entirely favourable to the plan of Dr. Louvet. Two of the cylinders had been exposed for more than six months to the effects of heat, rain, snow, and pretty sharp frost; yet the contents were in perfect preservation, and all the insects destroyed. As regarded the cost of the apparatus and its maintenance, the following particulars are given.—The cylinders for 50 hectolitres (actual contents 53·450, 2·10 metres high, 1·80 in diameter, and weighing 1,400 kilogrammes (nearly a ton and a-half), cost 840 francs (£33 12s.), including the inventor's charge and the manomètre; the expenses of the other accessories, transport, &c., raise this figure to £40. Calculating the interest on this sum at 8 per cent. this would give an expense of about 16d. per 22 gallons, but which would be diminished in the case of larger cylinders to about 11d. To this must be added the cost of the pump, from £12 to £48, or its hire. A great recommendation in favour of Dr. Louvel's plan is the absence of any necessity for housing the cylinders, which only require a coat of paint every third year, and the contents are secure not only against weevils, but also against rats and all other depredators, as well as fire, while a simple examination of the manomètre tells whether all is right within.

The same system is coming into use in France for the preservation of hops. The cylinders are made to contain about one hundredweight, and are tinned. The cost in this case is trifling compared with the importance of preserving the aroma of the hop, and prevention of loss in weight is also deserving of notice. When it is considered how thoroughly established is the principle of the exclusion of air in the preservation of organic substances, the wonder is not that the application should be extending, but that its extension should have been so long delayed.

NEUMEYER'S NEW POWDER FOR GUNS AND BLASTING.

The new powder discovered by Herr G. A. Neumeyer, a manager of stone quarries at Taucha, near Leipzig, is said (Berg- und hüttenmännische Zeitung, No. 36, 1866, p. 309) to possess the following properties:—

1. The powder burns, but does not explode if the air has access.

To prove this the following experiments were made last year at Altenburg in presence of the Town Council:

(*a*.) An earthenware drain pipe, about 11 inches long and 4½ inches internal diameter, was placed upon a brick and buried in the ground for two-thirds of its length; it was then filled with about 4½ lbs. of Neumeyer's powder and this lighted. The powder burnt quietly, merely sending up a long flame. After the experiment the drain pipe was found to be quite uninjured.

(*b*.) A conical earthenware tube, 15½ inches high and 4½ inches in diameter at the bottom, and rather more than 1 inch at the top, was buried in the ground for two-thirds of its height, and filled up to the mouth with about 1 lb. 6 oz. of Neumeyer's powder. On being lighted, the powder burnt somewhat quicker than in experiment *a*, but the vessel was uninjured.

(*c*.) An earthenware bottle, with a large body and very small neck, was filled with 1 lb. 10 oz. of Neumeyer's powder. It burnt very quickly, giving a long flame; the upper part of the vessel broke off in consequence of the great heat and fell down by the lower part.

As counterproof a similar, but smaller, vessel was filled with about 9 oz. of ordinary powder; it exploded with a loud report, and the vessel was broken into numberless fragments which were scattered about for a great distance.

(*d*.) A very instructive experiment was performed with an iron gun-barrel 2 feet long and ¼ inch in diameter. The barrel was filled up to the muzzle with Neumeyer's powder, and this was lighted through the touch-hole. The powder burnt, sending out a curved flame through the touch-hole, and it was only the last portions that were projected in a small flame from the muzzle.

On the 27th November, 1865, the following experiment was made in a quarry at Taucha, and shortly afterwards it was repeated before a large assembly at Altenburg. A small house was built, 4 feet 8 inches high, 2 feet 6 inches long, and 2 feet 6 inches deep, the walls being 5½ inches thick. In front an opening for a door was left, 11 inches square, and at each gable end there was a window 3¾ inches square, closed with thin boards. A wooden box with 33 lbs. of Neumeyer's powder was put in through the opening for the door, which was then closed with a piece of sheet iron. The powder was ignited by a fuse; it burnt without making any impression on the house, and even the wooden box retained its shape, being merely charred. To show the contrast with ordinary gunpowder, a pound of this, loose as in the previous case, was put in the little house. On its being ignited, the house was shivered into pieces.

2. Neither pressure nor percussion will cause it to ignite.

3. Its explosive force is equal to that of ordinary powder or even greater.

4. It leaves behind less residue than ordinary powder.

5. It does not attract more moisture from the atmosphere than ordinary powder.

6. It leaves behind less powder-smoke than ordinary powder. Its smoke, moreover, is light, disappears quickly, and has no injurious effect on the health of the workmen.

7. It is cheaper than ordinary powder in the proportion of 80 to 81. The prices by weight are the same, but as it has been found that 76½ grains of Neumeyer's have the same explosive force as 79½ grains of ordinary powder, the above proportion may easily be deduced.

It seems, then, that Neumeyer's powder is as strong as ordinary gunpowder in spaces that are made as far as possible air-tight, but that when the air has access it burns without exploding. If this is really the case, we gladly agree with Herr Wohlfahrt, Inspector of Mines in the Duchy of Saxe Altenburg, who adds the following concluding words to Herr Neumeyer's pamphlet:—

"I must really call Herr Neumeyer's discovery a blessing for mankind when I look at the frightful accidents caused by explosions, which recur year after year in all quarters of the globe. I need only recall the great explosions at Mayence and Erith, and that which happened lately in the laboratory of M. Aubin in Paris. All imaginable precautions, the strictest regulations, and the most expensive arrangements for transport and storing, do not strengthen the thread by which the life of those who have to do with gunpowder must always hang. How many soldiers are killed in battles when an ammunition waggon explodes, and how much greater is the disaster when the powder magazine explodes on board a man-of-war! All these disasters in war and in peace will be avoided by the use of Neumeyer's powder. Accidentally ignited it will burn out quietly, whether in a massive tower, in ammunition waggons, or on board ship, but will not explode. It will at most lift up the valves which should be fixed to the cases, and probably will not cause the fire to extend to other combustible materials, for I expect it will have a similar effect to Bucher's fire extinguishers. Just as the spectators stood only five paces from the little house when 33 lbs. were burning, so one will be in perfect safety at a short distance when several tons are lighted."

Fine Arts.

ENLARGEMENT OF THE NATIONAL GALLERY.—The recent purchase of new pictures renders the need for additional wall space more than ever imperative. It is with the greatest difficulty that the existing pictures can be hung; chronological sequence has in some measure to be broken, and pictures which students would like to examine on a level with the eye are crowded away to a fourth line at the ceiling. How room will be found for further acquisitions which may be made within the next two years it is difficult to conjecture. About that time the academy will probably be in a position to surrender to the National Gallery the rooms they now hold; thus the present gallery will be nearly doubled. This additional wall space is not more than sufficient for the works at present in Trafalgar-square. The pictures of the English school must thus remain at Kensington till the new building at the rear of the square shall be erected. The total space then provided for the National Gallery, British and foreign, will be nearly four times the present area, and the collected pictures and drawings will reach about 1,000. The following is an approximation to the number of works in the leading continental collections: In the gallery in Milan 503, in Turin 569, in Venice 688, in Naples 700, in Berlin 1,250, in Munich, new and old, 1,480, in Vienna, 1,550, in the Uffizi, Florence, 1,200, in the Louvre 1,800, in Madrid 1,833.

W. MULREADY, R.A.—The bust of the late William Mulready, by H. Weekes, R.A., exhibited in the last Royal Academy, is now placed with other memorial works in the entrance hall of the National Gallery.

LIFE OF HOLBEIN.—Mr. Wornum has completed the letter-press of his life of Holbein: and the handsome volume only awaits some few illustrations. The ornamental letters and the head and tail pieces are all from the designs of Holbein. The work will contain about fifty illustrations, including photographs from two of the celebrated drawings in the Windsor collection. This life, to which Mr. Wornum is known to have devoted long study, will discuss and probably set at rest many moot points such as those relating to the will of Holbein, the date of his death, and the genuineness or otherwise of the 68 reputed Holbein portraits recently exhibited at Kensington.

PAINTINGS AT THE LOUVRE.—At the present time the gallery of paintings at the Louvre contains 2,000 pictures, of which 560 are of the Italian school, 620 of the Northern schools, 700 of the French school, 25 of the Spanish school, and the remainder of various schools. In the Italian school may be numbered 12 paintings by Raphael, 3 by Correggio, 18 by Titian, 22 by Albano, 13 by Paulo Veronèse, 9 by Leonardo di Vinci, 5 by Perugino, 4 by Giorgione. The Northern schools are represented by 22 Rubens, 22 Van Dycks, 11 Gerard Dows, 17 Rembrandts, 11 Philip Wouvermans, 12 Teniers, 7 Adrian Ostades, 6 Ruysdaels, 2 Holbeins, 11 Berghems, 10 Van Huysums, 3 Lucas Van Leydens, &c. The French school is represented by 40 pictures by Poussin, 48 by Lesueur, 16 Claude Lorrains, 20 by Philippe de Champaigne, 17 by Sebastian Bourdon, 2 by Lebrun, 12 by Mignard, 41 by Joseph Vernet, 1 by Largillière, 1 by Watteau, 13 by David. Of the Spanish school may be counted 11 Murillos, 6 Velasquez.

Manufactures.

CLOTH FROM HOPS.—The stalk of the hop plant has already been employed in the manufacture of paper, but M. Van der Scheldon hopes to make use of it as a textile material, and to obtain from it a coarse cloth of good quality. The following is the process recommended by M. Van der Scheldon for this purpose. After the flowers of the hop have been gathered, the stalks are cut, made into bundles, and steeped like hemp. The maceration is the most important operation; for if it is not done with proper care, it is very difficult to separate the threads of the bark from the woody substance. After the stalks have been well steeped, they are then dried in the sun, beaten like hemp with a wooden beater, and thus the threads are loosened easily. They are then carded, and are ready for weaving in the usual manner. By this means a strong cloth is obtained. The thicker stalks also produce a thread suitable for the manufacture of rope.

A NEW USE FOR BARYTES.—Sulphate of barytes, sometimes known as heavy spar, has been extensively used for many years to adulterate white lead in painting, being so much cheaper, and of a finer white. Address and visiting cards were formerly coated with white lead, but this enamel, and, consequently, the printing on it, was liable to be wiped off. Prepared barytes is durable, and consequently preferred. A very great impetus has been given to the use of barytes by the paper collar trade. When the collars were covered with white lead there was reason to fear that health might be endangered by the pores imbibing this deleterious substance. Barytes has therefore been substituted with so much success that twenty tons per day are used in New York City in the collar manufactories alone.

Commerce.

OYSTER CULTURE IN SPAIN.—A portion of the submarine telegraph cable between the mainland and the Balearic Islands being recently taken up, a quantity of oysters were found attached to it; this leads to the inference that the oyster might be propagated on the Spanish coast if proper beds were established for it.

SALMON FISHERY IN THE BALTIC.—Nearly all the salmon caught for a considerable zone on that coast is brought to Leba, a small port on the Prussian coast, where it is cut up, salted, smoked, and exported, principally to Dantzig, Kœnigsberg, Bromberg, Stettin, and other ports. In good years this small place furnishes 80,000 to 100,000 pounds of salmon. In these parts the fishery furnishes cod fish in large quantities and of excellent quality; prepared in the same manner as the salmon, this fish has become an article of commerce.

THE VINTAGE IN FRANCE.—From intelligence received from the different wine-growing districts in France, it appears generally that the vintage this year has been very satisfactory. About Chalons the returns of the vintage surpass by a quarter at least that of 1865, but the quality is generally indifferent. In the Macon district the produce appears to be this year about 45 hectolitres per hectare; last year being but 30 hectolitres. The wine is of moderate quality, and some is good. In the Beaujolais, one of the most favoured districts, both as regards quality and quantity, several sales of wines from the environs of Villefranche have been made at from 40 fr. to 42 fr. per double hectolitre. The quality of the wines of Revermont is very superior to that which was anticipated. In many vineyards it was necessary to suspend the vintage, as the vintage tubs were filled, and to wait till one tub had been drawn to use it again in order to finish the vintage. The new wine of 1866 has now begun to be sold retail. The quality of the wines of the Lyons districts is pretty good; the first tubs that have been tried have produced a lighter coloured wine than that of last year, but rather fiery; the last tubs, as usual, are better than the first, the grapes being riper with which they were filled. In a few days the vintage will be completed.

THE COTTON CROP IN MAJORCA.—The cotton plantations have produced excellent crops in Majorca. The quality of this year's produce surpasses the best of that of the United States.

POSTAL ANOMALY.—There is no book post between this country and the United States of America, while there is a book post between France and the latter country; and what is still more strange is that this French service all passes through England. A New Yorker sends to a Paris house for an English book because he cannot get it direct from English publishers; the Paris house procures it from England and posts it in France for his New York correspondent, and the book thus posted goes through England to reach New York. It is said that the want of an international copyright between England and the United States is the cause of this anomaly, the Americans not desiring to give direct facilities for the introduction of English books, the sale of which would interfere with their reprints, for which they pay the English author nothing. Be this as it may, the fact remains as stated above.

Colonies.

A BRANCH EXHIBITION, preparing for the Intercolonial Exhibition in Melbourne, has opened at Beechworth with much ceremony. Nearly every district was represented.

TELEGRAPHIC COMMUNICATION WITH AUSTRALIA.—A representative of the Netherland India Steam Navigation Company has submitted to the chief secretary a proposition for the establishment of a line of electric telegaph from South Australia to Adam's Bay, through Victoria, New South Wales, and Queensland, *viâ* Cape York and Burke Town. A submarine cable would be required to connect Adam's Bay with Zimor, another would have to be laid from Zimor to the north of Java, thence to Singapore, thence to Malacca, to Moulmein in the Burmese Empire, and thence to Europe, *viâ* Calcutta. The estimated expenses of the line from Burke Town is £33,000. The length of the submarine is computed at 1,420 miles; thus Adam's Bay to Zimor 480 miles, thence to Malacca 480 miles, thence to Java 460 miles, estimated to cost £198,800, to which is to be added £33,000, the estimated cost of the line from Burke Town to Adam's Bay, together equal to £231,800, and allowing £57,950 for extra charges, the total cost of the line would be about £289,750.

SPIRIT MANUFACTURE IN AUSTRALIA.—It appears by a Perth (Western Australia) paper that another memorial is likely to be forwarded to the home government to rescind the prohibition of distilling in the colony, from which native industry still suffers. Some four years ago a vineyard distillation ordinance was enacted by the colonial government, but not sanctioned by the home authorities. This ordinance made it lawful for vine-growers to distil the produce of their vines, and to fortify wine manufactured in the colony free of duty. The absence of these facilities, considering the amount of land well adapted for vine cultivation, is said to constitute a serious grievance, and to form a material hindrance to colonial progress.

TARIFF IN TASMANIA.—The colonial ministry have proposed to do away with all the customs' duties with the exception of those chargeable on spirits and tobacco, with the view of encouraging trade, commerce, and population to Tasmania, and instead of these duties to make good the revenue by a tax to be levied on all the annual value of property and on all incomes upwards of £80, in Tasmania and its dependencies. It was further proposed that after 31st December next, ships arriving and departing from the Tasmanian ports should be relieved of harbour dues and wharfage, and instead of this a sum equivalent to the amount thus to be withdrawn from the marine boards, or such sum as may be required, to be paid out of the general revenue. These changes the ministry propose should come into operation on January 1st, 1867.

QUEENSLAND CATTLE TRADE.—An effort is being made at Bowden to establish the export of cattle from that port to the East. The *Australia* sailed for Batavia from Bowden with 300 sheep and 75 head of cattle on board. The speculation is a promising one, as beef is said to be worth 1s. per lb. at Batavia.

THE PASTORAL INTEREST IN NEW SOUTH WALES.—A colonial paper states that the mild weather that has followed the rain has given so good a supply of young grass, that it is fully expected that a fair average percentage of lambs will be reared. At the same time, the experience of the last two years has had the effect of drawing attention to the necessity for making provision for a permanent water supply for stock. Dam making, tank sinking, and in the back country boring for wells, is now becoming very general, and would be even more so had the Crown tenants anything like a certainty of tenure. The attention of squatters is now limited only to spots that are not likely to tempt the free selectors, or blocks that may have been purchased. It would evidently be of little benefit to construct a reservoir or tank, if the land around could at once be taken up under conditional purchase. In connection with sheep farming, the nuisance and loss attending the passage of travelling sheep, not travelling for *bonâ fide* purposes of exchange or sale, has at last excited very general complaint and remonstrance. The Crown tenant who, to keep his stock in good condition, does not overstock his run, and thinks thereby to preserve a bit of feed for bad times, is liable to have all his cherished grass eaten off by the first speculative proprietor of ten or twelve thousand sheep who may hear of the little bit of feed. Some of these persons have no runs at all. Others have runs capable of carying say ten thousand sheep and keep twenty thousand on them. Of course, when the feed is gone, the sheep would starve, were not the expedient of travelling resorted to. In this way the steady persevering man is victimised by the sharper and more know-

ing. Except in the high table lands, where the frosts are heavy, and snow storms have already commenced, cattle generally are improving in condition, and the new spring of grass will give them strength to bear any heavy weather they may have to encounter between now and the spring.

Notes.

ECOLE DES PONTS-ET-CHAUSSÉES, PARIS.—Since the year 1854 the public has been admitted to the courses of instruction in this important engineering school, the only formality being an application to the director. The session commences in November, and the subjects announced for the year 1866-7 are as follow:—Roads, bridges, railways, inland navigation, marine works, resistance of materials, steam engines, geology, mineralogy, agricultural hydraulics, administrative regulations, and political economy.

PROGRESS OF EDUCATION.—It appears by some American journals that the tribe of Ottoway Indians have imposed upon themselves a contribution, the produce of which is to be devoted to the establishment of a university. China is also sending to Europe new missions composed of learned mandarins, who are to study the laws of various nations, and to make a report from which the Emperor of the Celestial Empire may be able to judge the modifications that can best be made in Chinese legislation.

ITALIANS IN FOREIGN COUNTRIES.—The number of Italians established in different countries of the world are as follows:—In France, 76,500; in Algeria, 7,400; in England, 4,500; in Switzerland, 13,809; in Egypt, 15,060; in Tunis, 6,006; in the United States, 40,000; in Brazil, 18,000; at Buenos Ayres, 10,000; in Peru, 8,000; making a total of 100,000 Italians residing in foreign countries. The inhabitants of the Ligurian provinces and of Como are those that principally emigrate. Unlike the Irish and German emigrants who leave their country without thinking of returning, the Italians go to seek their fortune abroad with the hope of returning one day to their native country.

MEDALS FOR THE DISCOVERY OF PHOTOGRAPHY AND THE ELECTRIC TELEGRAPH.—Two medals, of large diameter, have recently been struck at the mint at Paris, to commemorate the two principal discoveries of the age, photography and the electric telegraph. The dies were engraved by the two eminent artists, MM. Oudiné and Bovy. Photography, by M. Oudiné, is allegorically represented. A female figure holds in one hand a metallic plate, whilst the other, pointing to the heavens, commands the light to print on it the required image. The nobleness of the attitude, and of gesture, the good arrangement of drapery, all tend happily to express the idea of science subduing matter, and converting the sun to an obedient servant. Another female figure, or rather winged genius, represents the electric telegraph, her feet just touch a galvanic battery, and her arms extend over the dials of the instruments, whilst telegraphic wires crossing each other seem to seize on its passage the thought that flies from pole to pole, and write it by means of nimble pens. The lightness and grace required for such a subject have found an elegant interpreter in M. Bovy. The figure, though somewhat ethereal, is treated with exquisite feeling, and the floating draperies have the motion, the suppleness, that is so admired in the works of Coysevox, Lemoyne, and Couston. These medals may be purchased at the sales room of the Hôtel des Monnaies.

PARIS EXHIBITION OF 1867: FREE VISITS FOR WORKMEN.—In several Departments the General Councils at their recent meetings have voted special funds for paying the travelling expenses and costs of stay in Paris for a certain number of workmen, selected by their companions to visit the Paris Exhibition in 1867. The government, also uniting in this idea, have turned their attention to in extending it also to the various agricultural and manufacturing centres. A state grant will complete the sums allowed by the departments, and already increased by the mutual aid societies and by public meetings. These have treated about the stay in Paris, which will be of about a month. As to travelling expenses, the railway companies have offered with laudable alacrity to grant free passes to the delegates from the bodies of workmen and from the agricultural districts.

THE proposition made to send from California a section of the "original big tree" (*Wellingtonea*) to the Exhibition at Paris is said by Dr. Macgowan to be impracticable, for want of a saw long enough to cut it. The cutting will require a saw forty feet long.

CIVIC HONOUR TO GENIUS.—The new Italian government seems fully alive to the debt which its country owes to genius, and has already exhibited on many occasions a laudable desire to pay due honour to the memory of those whose labours have made Italy one of the most envied amongst nations. The authorities of Milan have just decided that forty-five commemorative tablets shall be set up in the principal streets and squares of the city, each one bearing the name of an illustrious Italian, and recording the most remarkable acts of his life. The following is a list, nearly complete, of the names selected for the purpose:—Pétrarch, Corio, Mosone, Léonardo da Vinci, Girolamo Cardano, Bonaventure Cavalieri, the poet Maggi, Ludovico Muratori, Georgio Giulini, Pietro Verri, Beccaria, Gaetana Agnesi, Giuseppe Parini, Ugo Foscolo, Volta, Melzi, Appiani, Canova, Oriani, Jean Melchior Gioja, Romagnesi, Carlo Porta, Thomaso Pompeo Litta, Carlo Ottavia, Castiglioni, Jean Bat. and Massimo d'Azeglio.

LITERARY INSTITUTIONS IN PARIS.—Several attempts have been made, during the last few years, to establish popular institutions in Paris for literary and scientific purposes, but the success has not been great, the regulations respecting association have stood greatly in the way of such endeavours, and the rates of admission have, in consequence, been necessarily too elevated for the means of the majority of the public. A new and bold attempt is now being made. A special building to be applied to the purposes referred to has been erected in one of the best positions in Paris, close to the new opera, at a cost, it is said, including decoration, of a million of francs. The new Athenæum is to be devoted to literary and scientific lectures and *conférences*, or *entretiens*, as they are generally called in France, and also to classic music. It is hoped that the doors of the new institution will be opened early in November. The following are amongst the names of professors and others submitted to the Minister of Public Instruction, whose sanction is necessary in the case of each lecturer:—MM. Babinet, Bandrilla, Beulé, Delaunay, Janet, Maury, all members of the Institute of France; MM. Caro, Gaudry, George Ville, Wurtz, Perdonnet, Riche, and Leon Say, in science and political economy. Amongst literary men are M. Emile Augier and Legouvé, members of the Academy of France; Paul Féval, Théophile Gautier, Jules Janin, Taine, and Weiss. This is a remarkable array of talent, and, if circumstances turn out propitious the new Athenæum should have a brilliant future.

Correspondence.

THE ELECTRIC TELEGRAPH OF ENGLAND.

SIR,—I request the favour of your inserting in your impression of this week, the accompanying award of the late Sir Isambard Brunel and Professor Daniell, in an arbitration which took place in 1841, on some [illegible]

points as to the invention and origination of the electric telegraph.

With the award, which you will observe is ratified by the signatures of both of us, I send two volumes published by me in 1856 in consequence of circumstances fully explained in the preface to the first volume, which I hope the Society of Arts, as guardian of the history of practical science, will allow to be placed in its library.

The first volume contains three pamphlets published by Professor Wheatstone and myself in 1854 and 1855, arising out of an article which had appeared in the *Quarterly Review*. The second volume contains copies of the statements and drawings which were before the arbitrators.

My excuse for troubling you with this letter is that the *Times* is claiming for Professor Wheatstone the sole invention of the electric telegraph, and refuses insertion to letters from my friends calling attention to the award. —I am, &c., William Fothergill Cooke.

Aberia, Carnarvon, Oct. 24, 1866.

Award.

As the Electric Telegraph has recently attracted a considerable share of public attention, our friends, Messrs. Cooke and Wheatstone, have been put to some inconvenience, by a misunderstanding which has prevailed respecting their relative positions in connexion with the invention. The following short statement of the facts has, therefore, at their request, been drawn up by us the undersigned Sir M. Isambard Brunel, Engineer of the Thames Tunnel, and Professor Daniell, of King's College, as a document which either party may at pleasure make publicly known.

In March, 1836, Mr. Cooke, while engaged at Heidelberg in scientific pursuits, witnessed, for the first time, one of those well-known experiments on electricity, considered as a possible means of communicating intelligence, which have been tried and exhibited from time to time, during many years, by various philosophers. Struck with the vast importance of an instantaneous mode of communication to the railways then extending themselves over Great Britain, as well as to government and general purposes, and impressed with a strong conviction that so great an object might be practically attained by means of electricity, Mr. Cooke immediately directed his attention to the adaptation of electricity to a practical system of telegraphing; and, giving up the profession in which he was engaged, he, from that hour, devoted himself exclusively to the realization of that object. He came to England in April, 1836, to perfect his plans and instruments. In February, 1837, while ngaged in completing a set of instruments for an intended xperimental application of his telegraph to a tunnel on he Liverpool and Manchester Railway, he became acquainted, through the introduction of Dr. Roget, with Professor Wheatstone, who had for several years given nuch attention to the subject of transmitting intelligence y electricity, and had made several discoveries of the ighest importance connected with this subject. Among hese were his well-known determination of the velocity f electricity, when passing through a metal wire; his xperiments, in which the deflection of magnetic eedles, the decomposition of water, and other voltaic nd magneto-electric effects, were produced through reater lengths of wire than had ever before been exerimented upon; and his original method of converting few wires into a considerable number of circuits, so at they might transmit the greatest number of signals, hich can be transmitted by a given number of wires, r the deflection of magnetic needles.

In May, 1837, Messrs. Cooke and Wheatstone took t a joint English patent, on a footing of equality, for eir existing inventions. The terms of their partnerip, which were more exactly defined and confirmed in ovember, 1837, by a partnership deed, vested in Mr. ooke, as the originator of the undertaking, the exclusive anagement of the invention in Great Britain, Ireland, and the Colonies, with the exclusive engineering department, as between themselves, and all the benefits arising from the laying down of the lines, and the manufacture of the instruments. As partners standing on a perfect equality, Messrs. Cooke and Wheatstone were to divide equally all proceeds arising from the granting of licenses, or from sale of the patent rights; a per-centage being first payable to Mr. Cooke, as manager. Professor Wheatstone retained an equal voice with Mr. Cooke in selecting and modifying the forms of the telegraphic instruments, and both parties pledged themselves to impart to each other, for their equal and mutual benefit, all improvements, of whatever kind, which they might become possessed of, connected with the giving of signals or the sounding of alarums by means of electricity. Since the formation of the partnership, the undertaking has rapidly progressed, under the constant and equally successful exertions of the parties in their distinct departments, until it has attained the character of a simple and practical system, worked out scientifically on the sure basis of actual experience.

Whilst Mr. Cooke is entitled to stand alone as the gentleman to whom this country is indebted for having practically introduced and carried out the electric telegraph as a useful undertaking, promising to be a work of national importance; and Professor Wheatstone is acknowledged as the scientific man whose profound and successful researches had already prepared the public to receive it as a project capable of practical application; it is to the united labours of two gentlemen so well qualified for mutual assistance, that we must attribute the rapid progress which this important invention has made during the five years since they have been associated.

(Signed) Mc Id Brunel.
J. F. Daniell.

London, 27th April, 1841.

London, 27th April, 1841.

Gentlemen,—We cordially acknowledge the correctness of the facts stated in the above document, and beg to express our grateful sense of the very friendly and gratifying manner in which you have recorded your opinion of our joint labours, and of the value of our invention.

We are, Gentlemen, with feelings of the highest esteem, Your obedient servants,

(Signed) William F. Cooke.
C. Wheatstone.

Sir M. Isambard Brunel, and
J. F. Daniel, Esq., Professor, &c., &c.

Well Water and Sewage Gas.—Sir,—The surface wells of the metropolis, once the boast of localities for coolness and sparkling purity, are now sadly degraded in public esteem. Almost every London parish churchyard in an actual thoroughfare, has now or had but a brief period since, its ornamental pump, erected by the generosity and collective wisdom of its parish management; the economist of the parish standing aside and allowing the pump, like the beadle, to be a notable parochial object, the embodiment of utility and ornamentation. In some cases, as in this parish of St. James's, a parishioner has erected, opposite the churchyard in Piccadilly, a costly structure that told its tale of generosity, at a cost exceeding £200. What should we think now of a parishioner whose benevolence was gratified by the erection of a pump opposite the churchyard with its rusty ladle to slake the thirst of the tired wayfarer? The sad mortality during the past summer is again directing attention to well water, for with a surrounding soil such as London surface soil has become, impregnated with gas and defiled with impurities, the wells themselves, "out of sight out of mind," becoming frequently the receptacles for the leakage of defective drains and sewers, as a source of water supply for drinking purposes, now meet with unqualified condemnation. This parish formerly had twelve wells, four of which are now filled up, and this course, judging from

the past, may be pursued with the remaining eight, and the same action will doubtless progress through the other parishes of the metropolis, whilst at the same time flushing and water supply for that purpose become an item of considerable parochial cost. To utilise the water supply from these wells, and instead of filling them up, to divert the water into the sewers throughout London or its flat portions, wherein the sewage now passes, evolving gaseous products that fill the air with impurity would, in my opinion, be of great advantage. The Middlesex portion of the metropolis would be found to have a sufficient natural fall towards the Thames to admit of this being done, were not the surface covered with costly structures that present a difficulty as to choice of way, and thus the question, how to divert and utilise this natural supply for the cleansing of our sewers, so that the result in each case may be worth the cost, becomes an important problem for the hydraulic engineer, and one of which the solution must not be delayed, or it will otherwise become impossible, as most parishes will have done what we have already done with one-third of our wells, filled them up. If the Government of London was more municipal and less parochial and bureaucratic, I cannot help thinking the aid of such bodies as the Society of Arts would be often found very valuable in leading the way to more practical results with metropolitan works.—I am, &c., HENRY WEBBER.

Brewer-street, Golden-square.

To Correspondents.

ERRATUM.—In last *Journal*, p. 736, col. 1, line 14 from bottom, for "Gainsborough" read "Guisborough."

Patents.

From Commissioners of Patents' Journal, October 19th.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—2565—D. C. Pierce.
Animal charcoal, revivifying—2460—W. Cormack.
Artificial fuel—2534—D. Barker.
Boats from their davits, detaching—2261—H. A. Bonneville.
Boilers and boiler furnaces—2546—H. Fisher.
Bolts and washers—2524—J. Chalmers.
Brewing, &c.—2416—A. B. Walker.
Brushes—2436—I. Dimock.
Carriage breaks—2414—G. J. Walker.
Chimes—2516—D. Imhof.
Chronometers, &c.—2446—W. Weichert.
Churns—2500—G. Slater.
Compound lenses—2502—J. H. Dallmeyer.
Confectionery—2512—W. and J. W. Wood.
Corn, drying—2486—J. Y. Betts.
Decorticating machines—2519—P. P. J. Martin.
Dies—2438—D. J. Fleetwood.
Door furniture, affixing knobs to spindles of—2492—W. R. Corson.
Drifting and rivetting machines—2499—T. W. Bunning.
Elastic mats and coverings for floors—2541—T. Forster.
Electric currents, transmitting facsimile copies of writings, &c., by—2480—H. A. Bonneville.
Electric telegraph signs, reproducing—2513—W. Clark.
Electric telegraphs—2514—W. Clark.
Fabrics—2422—G. Davies.
Fibre, washing—2557—G. E. Donisthorpe.
Fibrous materials, preparing, &c.—2462—J. Lawson and E. G. Fitton.
Fibrous materials, producing fibres from—2497—H. E. Gilles.
Fibrous materials, weaving—2482—H. A. Bonneville.
Fibrous substances, carding—2563—F. W. Kaselowsky.
Fire-arms—2520—W. la Penotière.
Fish-tail gas burners—2537—M. West.
Fluid meters—2434—J. M. Heppel.
Fluids, filtering—2525—P. R. Hodge.
Fuel—2450—A. F. Stoddard.
Furnaces—2476—H. Aydon and G. B. Jorram.
Furnaces—2494—J. Burgum.
Furnaces—2527—W. Clark.
Gas—2528—P. A. Batchelor.
Grate bars—2559—J. H. Johnson.
Guns, breech-loading—2424—G. Stuart.
Hydraulic presses—2538—J. Daniel.
Imponderable fluids—2536—C. E. Brooman.
Incubators—2567—F. H. Schroder.
Iron and steel—2452—J. Calvert.
Iron and steel, casting—2522—J. Whitworth.
Iron cylinders, casting—2518—J. Gueunier-Lauriac.
Iron ships, sheathing—2495—J. C. Bayley and D. Campbell.
Mattresses—2533—J. Oetzmann.
Metallic axles, forming collars on—2561—W. E. Newton.
Milk, preserving—2478—T. Amey.
Motive power—2508—J. S. Johnstone.
Moveable door screens—2412—C. H. Chadburn.
Musical instruments—2468—W. E. Newton.
Oils, distilling—2496—A. V. Newton.
Oils, utilising residues obtained from distilling—2472—J. J. Lundy.
Opaque objects, representing—2550—J. H. Wrench.
Paint, substitute for—2540—W. Hope and H. Browning.
Paraffin oil, lamps for burning—2442—F. R. Mosley.
Pianofortes—2488—G. H. Brockbank.
Pocket-books on the person, securing—2504—F. W. C. Bremann.
Power looms—2503—E. B. Bigelow.
Railways, permanent ways of—2432—T. A. Rochussen.
Railway switches—2509—J. H. Johnson.
Railway tickets, marking—2545—R. Mortimer.
Railway trains, communication between the guard, engine driver, and passengers in—2542—C. E. Spagnoletti.
Railway trains, stopping—2423—G. A. Laurent.
Reaping and mowing machines—2523—R. Hornsby and J. E. Phillips.
Refrigerators—2526—A. M. Dix.
Resinous substances, solvents for—2418—C. Crump.
Safety belts—2510—C. Fox.
Safety valves—2539—J. R. Swann.
Saws, securing teeth in—2426—W. Clark.
Self-feeding cotton gins—2501—J. A. Chaufourier.
Ships' anchors—2420—J. W. Morgan.
Ships from foundering, preventing—2498—J. E. Thibault.
Ships, pumps for—2474—T. B. Taylor.
Smoke, consuming—2458—H. Turner.
Steam engines—2466—A. V. Newton.
Steam engines—2515—D. Joy.
Steering vessels—2456—A. V. Newton.
Stoves—2448—T. Whitaker and J. Constantine.
Vessels, raising—2547—W. D. Scott.
Water-closets—2532—J. Cavanah.
Water-closets, &c.—2493—T. Lythgoe.
Washing machines—2506—J. and J. Broughton.
Water supply—2428—R. Richardson and J. Imray.
Weaving, reeds or combs for—2444—J. C. Ramsden.
Weights—2430—A. V. Newton.
Window sashes, securing—2511—S. Price.
Woven fabrics, shaping belts of—2555—G. P. Dodge.
Wringling and mangling machines—2440—T. Atkinson, jun.
Wrist, ornaments for the—2569—J. Badcock.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Watchmen, detecting apparatus for registering the time of—[illegible]—J. B. Buerk.

PATENTS SEALED.

1108. G. Lunge.
1112. C. Hastings, J. Briggs, J. Law, and H. Mitchell.
1116. J. Leigh.
1118. J. Allen.
1126. J. O. Ramsbottom.
1132. F. C. Buisson.
1134. J. H. Wilson.
1136. G. E. Donisthorpe.
1137. J. Player.
1138. G. E. Donisthorpe.
1146. E. H. Huch and F. J. Windhausen.
1154. S. Thompson.
1159. D. Blèvex.
1173. W. Edmond and A. [illegible]
1192. J. Howard & E. T. [illegible]
1194. T. Dixcee.
1196. T. A. Weston.
1206. H. E. Newton.
1207. A. V. Newton.
1311. J. H. Johnson.
1337. W. Hackett & W. [illegible]
1679. P. Barlow.
1938. W. E. Newton.
1971. G. T. Bousfield.

From Commissioners of Patents' Journal, October 23rd.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2539. J. Shanks.
2572. G. Davies.
2623. W. Betts.
2641. M. Vian.
2683. H. Cochrane.
2590. J. Dodd.
2606. W. W. Burdon.
2607. R. A. Brooman.
2624. E. S. Crease.
2625. J. Davidson.
2579. T. C. Clarkson.
2700. W. Tasker, jun.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2334. W. Prosser.
2364. S. Newberry and H. Moore.
2355. A. S. Rott.
2380. J. Higgins and T. S. Whitworth.
2396. J. and H. Brackshaw, and W. S. Underhill.
2410. G. T. Bousfield.
2414. P. Jones.
2416. W. Fox and J. Wills.

Registered Designs.

Street Lamp—September 29—4815—W. F. Cotton, Dublin.
Blacking Bottle—October 3—4816—G. Baker and Son, Birmingham.
The Carleton Leglet Boot—October 4—4817—R. Carleton, [illegible], Westmoreland-street, Dublin.
Double-safety Self-fastening Lock, Latch, and [illegible] for Carriage and other Doors—October 13—4818—W. Dalziel, [illegible]-road, Deptford, Kent.
Spring Clip or File—October 18—4819—C. [illegible], [illegible]-place, Portman-square, W.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 2, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is ow published, and may be had *gratis* on ap- lication to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society f Arts, the Worshipful Company of Coach and oach Harness Makers offer a prize of £3 in 'reehand Drawing, and a prize of £2 in Practical lechanics, to the candidates who, *being employed ı the coach-making trade*, obtain the highest umber of marks, with a certificate, in those ıbjects respectively.

Institutions.

The following Institutions have been received to Union since the last announcement:—

Belfast, Rosemary-street Science School.
Kendal, Christian and Literary Institute.
Lancaster, Mechanics' Institution.

Proceedings of Institutions.

Ipswich Working Men's College.—The annual ›ting of the members of this College was held on ıesday evening, the 25th September, when the certifi- ›s awarded at the Society of Arts examination in ›ril last were distributed to the successful candidates. ıe chair was taken by the President of the Institution, e Lord Chief Baron of the Exchequer, Sir Fitzroy ›lly. The Lord Chief Baron said his appointment to › office he now held seemed to be no good reason why ı connection with this Institution should cease, for un- ›stionably it had in no wise lessened the feelings of ›p interest with which he had always considered and ired the well-being and prosperity of the Working n's College. He was very happy to find that during interval which had elapsed since the last meeting y had gone on and prospered. Without in any degree lervaluing the importance to the working man of ıring to himself some relaxation, after the hard work anxieties of the day, yet this fell far short in im- ›ance of the obtaining for the great body of the king-classes of this country a sufficient degree of cation to fit them for the condition which it was r destiny to occupy in society. After delivering interesting address on the value of education, the ıident called on the Principal of the College (Dr. Christian), who read the report of the Council. accounts (which had been audited by Mr. George ›stopherson) showed that the sum received was › 2s., and the expenditure amounted to £167 4s. 10d., ›ring a balance in hand of £2 17s. 2d. There was a ing increase from the revenue of members' sub- ›tions, chiefly owing to the large addition which been made on the register. The number of mem- last year was 653, and this year the number on books was 1,003. The usual classes had been satisfactorily carried on, and also classes for chemistry (under Dr. W. Elliston), and for animal physiology, in relation to health (under Mr. H. G. Moore). In addition to the prizes and certificates awarded by the Society of Arts, local certificates had been granted for elementary qualifications. The Friday evenings during the session were devoted to lectures, readings, recita- tions, and music. The thanks of the College were due to various gentlemen for readings and recitations, and to others for musical services. Amongst the gentlemen mentioned as having presented the College with books was Mr. J. A. Ransome, who presented the "Encyclo- pedia Britannica," in 42 vols. A cricket club had been formed; steps had been taken for opening a gymnasium; many pleasant social gatherings of the members and friends had taken place; an open air concert had been held in the Lower Arboretum in July, attended by about 2,000 persons; and in August between 300 and 400 of their friends enjoyed an excursion to Lowestoft. In conclusion, the report congratulated all interested in promoting the welfare of the working-classes, on the great prosperity of the Institution. Regret was expressed at the loss of two of the vice-presidents, Mr. Richard Garrett, and Mr. Jeremiah Head, and the Council most particularly thanked "the President of the College for the interest he has evinced in its progress, not merely by lending his name, but by aiding its efforts on every occasion, and countenancing it by his presence when required, for the willingness with which he has continued to be connected with the College after his elevation to a high and important post, and for the readiness with which he accepted the invitation to take the chair at the meeting this evening."—Mr. S. H. Cowell moved the adoption of the report, and expressed his pleasure in finding that the Lord Chief Baron had consented to continue President of the College, and to take the chair on the present occasion. This was seconded by Mr. R. C. Ransome, and carried unanimously.—The President then distri- buted the prizes and certificates to the successful candi- dates. The meeting was then addressed by Mr. G. G. Sampson, Mr. Henry Footman, Dr. Christian, Mr. J. A. Ransome, and Mr. R. Pearce, and concluded with a cordial vote of thanks to the president.

Yorkshire Union of Mechanics' Institutions.—*Hebden Bridge Mechanics' Institution.*—The annual *soirée* was held on Oct. 20, in the mill of Messrs. Crossley, kindly lent for the occasion, Henry W. Horsfall, Esq., president, in the chair. The report stated that the good effect of the examinations held under the direction of the West Riding Educational Board were beginning to be manifest. The well-selected library had been well used, and the Institution was generally in a very prosperous condition. Mr. Henry H. Sales, Rev. J. Nelson, and others, addressed the meeting. During the evening the prizes and certificates awarded to the members by the West Riding Board were distributed. *Northowram Mechanics' Institution.*—On Monday, October 22nd, the members and friends celebrated their fifteenth anniver- sary, under the presidency of Mark Dawson, Esq. Notwithstanding the high price of admission the at- tendance was good. Addresses were given by Messrs. Sales, Bolton, and Blakey. *Otley Mechanics' Institution.*—Major Fawkes presided at the annual *soirée* of this Institution on Tuesday, October 23, supported by the principal residents in the parish. The erection of a building for the Institute was strongly advocated by the vicar, and large promises of support were given by subsequent speakers. Previous to the distribution of the prizes an address on the Society of Arts Scheme of Examination was given by Mr. Henry H. Sales. *Long- preston Mechanics' Institution.*—The usual annual *soirée* was held in the hall of the Institution on Wednesday, October 23. The Rev. J. E. Coulson, vicar of the parish, occupied the chair. After tea there was a display of fireworks on the village green. The public meeting was held in the Institute, which was tastefully deco- rated with flags, banners, and evergreens, and lighted

with Chinese lanterns. Short addresses were given by the Chairman, Mr. Henry H. Sales, and the parochial clergy. The meeting over, the annual Institution ball commenced, and dancing continued for some hours. Although there are no classes in connection with this Institution, the benefits it has conferred upon the village by its reading-room, library, and social gatherings, are borne witness to by all the residents. The village ball, five years since, was a scene of dissipation —now the utmost decorum prevails, and the vicar states that "the behaviour of all present is not surpassed by the frequenters of state entertainments."

GOVERNMENT AID TO SCIENCE AND ART EDUCATION.

The following is the substance of a paper by Mr. W. H. J. Traice, of Pendleton, read at the Annual Conference of Science Teachers and Science Secretaries, with the Council of the Union of Lancashire and Cheshire Institutes, on the 11th of August last:—

Government aid has been for many years applied to promote instruction in practical art, and more recently to diffuse a knowledge of various branches of science. The objects of this paper are to direct attention to the principle upon which grants for these purposes may be made consistently with sound national policy, and to suggest some expansions and modifications of the scheme, designed to render it more equitable as well as more efficient.

The aid to art instruction has till recently comprised the training of teachers, the grant of certificates, and payment of such teachers an annual sum on each certificate, with other payments to the teachers or gifts to the art school, contingent on results and other evidences of the fulfilment of required conditions. Then encouragement has been given to pupils by certificates of merit, prizes, medals, and free studentships. In respect to science, with which on this occasion we are chiefly concerned, no instruction has been directly imparted, but teachers have been invited to submit their attainments to the test of examination, a distinct certificate being given of competence to teach any of the subjects on the official list of the Department of Science and Art. Then an annual examination of pupils being held, the teachers who have conducted the classes (provided they hold certificates in the respective subjects taught) are entitled to claim payment on the results, such payments being proportioned to the proficiency exhibited by the pupils. Those attending the classes are also encouraged by prizes.

It will thus be seen that at present payments on results are exclusively made to a certificated teacher, and then only for results produced in the particular subject for which he holds a science certificate. This obviously excludes all institutions from the advantage of government aid if a certificated science teacher is not in the neighbourhood, or if it is impracticable to make arrangements with one. But it is well known that many of the subjects forming part of the science and art scheme have been for some years taught in Mechanics' Institutions by persons in various professions and occupations, who, in many cases, would not be likely to prepare for the examination required to entitle them to obtain any government recognition of their labours. As the funds administered by the Department of Science and Art are national, and only applied to the fostering of scientific instruction on economic grounds, we are entitled to criticise not only the details of management, but to consider it in relation to the fundamental principles of the grant. Now the ground on which the Government is warranted in employing national funds to promote the special education of persons of all ages, adults as well as youths, in certain branches of art and physical science, is, that such instruction is needed to supply an alleged and generally acknowledged deficiency, which deficiency is most prejudicial to our manufacturing skill. It is contended that if there were in our shops and factories, and especially in those districts where art workmanship may so largely enhance the value of production, a good proportion of persons conversant with the scientific principles of the work they are engaged in, familiar with the leading canons of art, and possessing some facility in drawing and modelling, the introduction of this cultivated class would raise the standard of our manufactures, while promoting their economy.

As the funds are derived from the country at large, every district where they can be applied usefully should have a fair opportunity of sharing in the advantage of their distribution. Moreover, as the Government does not profess to conduct the instruction, or to provide all the funds, but only to aid local action, it is reasonable to ask that such assistance be rendered in any and every case where the instruction desired is imparted, subject to the test of examination, and to needful verification, but with the least possible official complication, always embarrassing, and too often obstructive. Accepting this as a basis, three modes of action may be taken, two of which have been adopted: a training school or college for teachers—this for art masters was for some years in operation, and still exists in a modified form—a similar institution for science teachers has not been formed, but the acquisition of the requisite attainments has been fostered by the examining and certifying teachers and offering them the prospect of earning certain allowances upon the results of their teaching. A third mode of promoting the diffusion of scientific knowledge would be by making an allowance to any teacher who produces pupils capable of passing the annual examination, subject to the same kind guarantee of the conditions required being fulfilled as exists already.

Supposing the present scheme adhered to, wholly or in part, it would be practicable to extend its usefulness by substituting one general examination, the passing which might be held a sufficient guarantee of a teacher's power; leaving it to the results which must be produced to secure adequate attention to special subjects of instruction. This plan would at least yield evidence of sound culture such as at present the department totally and perhaps very mischievously ignores. A teacher, having passed this general examination, might then teach any of the subjects on the list, and receive by direct payment the allowance on results. The examination and granting certificates in special subjects might be maintained; for many teachers, devoting themselves to science, would find the advantage of systematic training for the test, and of the reputation the certificate would confer.

But recurring to the fundamental object of the grant, the diffusion of instruction in science and art, and considering that the funds applied to the purpose are derived from the whole country, it is obviously only fair that a few reasonable conditions being insisted on, any neighbourhood should be allowed to participate in the benefit of the grant while helping to diffuse the knowledge it was made to promote. This could be carried out simply and efficiently by saying that payments on results would be made for the pupils of any classes conducted under the supervision of a properly constituted committee. If the payment were made to or through the committee it would be in their power to take advantage of any teaching ability attainable, and it would offer the further advantage of grouping pupils and having instruction in various stages carried on concurrently by different teachers. If, as often happens, some competent teacher would give instruction gratuitously, the committee could appropriate any funds accruing on the results, presented by the pupils so taught, for aiding to obtain instruction in other classes.

Under the existing arrangement it is impracticable to utilise all the teaching power of the certified science masters. A man qualified to teach chemistry will usually possess considerable knowledge of some branches

of natural philosophy, and be able to impart instruction n the elements of the mathematics. Unless, however, ie has secured a certificate in every subject he underakes to teach, his instruction is deprived of the enouragement the Government professes to give, no natter how successfully he may teach, or how satisfactory he results may be. It often happens that there are few upils offering for the subject in which a teacher holds a ertificate, while there are many for other branches of cience; and in these respects the system is as unsatisactory to the teacher, as it is inequitable, and calculated o defeat its own object. Perhaps the identification of ertificated masters with the department might be preerved by making all payments on the results of their eaching to them personally, instead of through a nanaging committee as suggested for non-certified nasters.

Another most important question arises relatives to he class limitation of the grant in respect to its bearing n national industrial culture. Is it desirable that llowances should only be made on results as produced y the working classes and their children? That it is nost desirable to secure for a large section—as large as possible—of the working classes the advantage of cientific culture likely to bear on their daily occupation s an admission involved in the constitution of the Department of Science and Art. Were it not so the xistence of much of its costly machinery would betray a vanton expenditure of public money. But falling back on he principle that the sole ground of justification for thus iding special education is that it is likely to be conucive to national advantage by improving our manuactures, economising their production, and fitting them o rival in taste as well as use those of other countries, we nay ask are the actual working people those who alone contribute their skill to bring this about? As there is a niddle class socially, there is a similar class in industrial production. The designer, the overlooker, foreman, general manager, operative chemist, the mine steward, nd many others fulfilling most important duties in onnection with productive industry, though not directly lassed as operatives, usually spring from them, or have aised themselves from their ranks. Such men, all more r less, share in the manual part of production, but lways under conditions to which considerable inteligence and often much special knowledge are essential. They are really the captains of industry, and to exclude them and their offspring from the benefit of any public endowment for promoting the higher branches of industrial education seems not merely an oversight but a fatal mistake. For it is to be borne in mind that the public advantages of diffusing scientific culture are not lesigned for its recipients alone: indeed the main purpose of aiding its diffusion regards the pupils so taught hiefly as agents to effect a great national good, while, n most cases, being themselves personally benefited y the instruction. It may be alleged that the better aid class connected with manufacturing, and engaged in Art-workmanship, can and will pay for the special intruction they require. This may be true in cases where uch instruction is indispensable to their occupation or retty sure to lead to direct advantages. But where it s uncertain whether a youth or a young man will find ny engagement in which his scientific knowledge can e made reproductive, by increased income or improved osition, he will hesitate to incur any expense for such nstruction.

Now the children of the class under consideration have sually received a good preliminary education, and they ave intellectual aspirations which will induce them to vail themselves of such opportunities as science classes ffer. If they attend such classes the teachers find that lthough these young people may prove the most diligent nd successful students, they bring no pecuniary adantage, as the results of their study are not recognized. uch pupils can scarcely be regarded with favour by the eacher unless they pay a remunerative fee, or their fathers for them; and as has been already stated, experience has shown that the ulterior advantage is too precarious and contingent to induce them to study and pay for it in full. Hence it appears that a great expansion of the present scheme is called for to admit the class under consideration to its benefits. Supposing it desirable to impose a limit on the persons for the results of whose scientific instruction the Government may reasonably be asked to pay, it is suggested that this might be fixed for students at an income not exceeding that of the highest paid skilled artisans of their neighbourhood, while in respect to sons and dependents, several positive claims might be recognised, much more likely to work well than the arbitrary exclusion of all paying income tax, whether pupils or parents and guardians.

The preliminary examination of pupils is another matter deserving careful consideration. It is seldom possible to make any useful application of special knowledge if its possessor is deficient in elementary instruction. This is so obvious that the Society of Arts have always required the candidates for their certificate to pass a preliminary examination. Several remarks of the Government examiners, the experience of the local committees, the vexation and loss to the teachers in having intelligent pupils incompetent to write legibly, spell correctly, express themselves accurately, or work a sum in proportion, and the bitter disappointment of the pupils themselves, combine to raise the question whether elementary knowledge should not be insisted on. Short, however, of insisting on a preliminary examination, it is manifestly the duty of committees and of the friends and advisers of the pupils to impress on them the urgent need of acquiring a moderate familiarity with the elements of instruction before seeking special scientific knowledge. There can be no doubt that much of the reluctance of pupils to enter upon the examinations is occasioned by a consciousness of what may be broadly designated as literary deficiencies. Perhaps one of the most signal advantages of the recognition by the Government of results and payments thereon in respect to science teaching, no matter by whom imparted, would be found in the more immediate relation of the teachers to the committees and institution. Supposing several branches of science to be conducted by one teacher, or, still better, that the whole of this department of a public educational institution were under the direction of one master, teaching alone, or with assistance, in either case, while noting the ignorance so obstructive of higher attainments, it would be to his interest to use his knowledge and influence to promote the needful preliminary training of the pupils upon a progressive and systematic plan. Much of the reluctance of pupils to enter upon the elementary course most desirable as a preparation for certain studies, or the more important acquisitions, in mathematics for instance, absolutely necessary for the due comprehension of most branches of physical science, arises from their impatience of what in their ignorance seems a needless drudgery; this reluctance might easily be dispelled by friendly counsel. Unfortunately, under the present system, the certified teacher often comes from a distance, and has no connexion with the Institution, no interest in the pupils but what may arise from attendance at a single class. Whether, then, by insisting on examination previously to pupils entering science classes, or by explanation and advice tendered by those whose position would give them the weight of authority, it is certainly of the utmost importance that a standard of attainment should be secured such as is at present only found exceptionally in the students of these classes.

ADULTERATION.

At the Pharmaceutical Conference, held at Nottingham, during the meeting of the British Association there, Mr. John Tuck exhibited, at one of the *soirées*, an interesting series of samples of adulterating materials,

placed at his service by the Hon. Board of Inland Revenue:—

1. "Original Indian Essence," consisting of methylated spirit, of a strength of 70·1 under proof, and treacle. 2. "Indian Tincture," consisting of methylated sweet nitre and treacle." 3. "The only original highly medicated and cordialised Indian Brandee," consisting of treacle and methylated spirit, of a strength of 47·3 under proof. 4. "Indian Brandee," consisting of methylated spirit, hyponitrous ether, and treacle. These four samples were sold as medicines, under the quoted names, but such compounds are in reality manufactured to be sold for beverages, and extensively used for this purpose in Lancashire and Yorkshire. The presence of methylated spirit in these compounds is clearly shown both by the iodo-hydrargyride of potassium and oxidation tests, as detailed in a paper read at the Birmingham meeting of the British Pharmaceutical Conference. 5. "Whiskee," containing methylated spirit of a strength of 60·0 under proof. 6. "Essence of Ginger," containing methylated spirit. These two samples were taken from a large quantity of spirits sold by public auction in Dublin, and when found to contain methylated spirit were seized by the Inland Revenue authorities. 7 and 21. Glucose, consisting of starch, sugar, and gum, and extensively employed in the manufacture of confectonary, and for the adulteration of jams and marmalade. It comes chiefly from France, and is made from potato or wheat starch. 8 and 9. Concentrated ale and porter wort, manufactured by the Concentrated Wort Company of Margate, to which has been given the name of "Grainstone." This concentrated wort is made of malt and hops, in the ordinary way, and reduced by a patent process to a solid hard substance. To convert this substance into beer, porter, ale, or stout, more or less water has to be added, according to the strength required, and when thus liquefied, it is fermented and racked off into casks, in exactly the same way as ordinary beer is brewed. The "grainstone" is exported in the solid state, in square tin cases, so that the heavy cost of the carriage of the water in ordinary beer is thus avoided; and, being hermetically sealed up, it will keep good without deteriorating or losing any of its qualities for years. Two pounds of this grainstone to every gallon of water makes a good beer. 10. Adulterant for porter, consisting of treacle extracted from sugar bags and refuse of sugar refineries. There is reason to believe that this species of adulteration is practised a good deal both in London and in the country. 11. Beer adulterant, consisting of spent hops, which contain a large proportion of grains of Paradise. 12. Beer adulterant, consisting of ground capsicum, starch, and sugar. This was discovered at Stockton-on-Tees. 13. Cavendish tobacco of foreign manufacture, adulterated with liquorice. This is found chiefly in seaport towns, and consumed principally by sailors. 14. Roll tobacco, adulterated with cabbage leaf. This sample was purchased in Glasgow. 15. Tobacco leaf in process of manufacture, adulterated with 19 per cent. of sugar. This was seized in a manufactory at Newcastle-on-Tyne. 16. High-dried or Irish snuff, containing upwards of 20 per cent. of caustic lime. This was obtained from Belfast. 17. "Snuff," coarsely ground, containing 2 per cent. of rhubarb leaf. The bulk of this snuff weighed several tons. Snuff is most extensively adulterated, and the following are some of the vegetable materials that have been used for this vile purpose, and seized by the Excise authorities:—Rhubarb leaves in several cases, acorns, dock leaves, sawdust, spent dyewoods, rhubarb, and coltsfoot leaves, the "comings" of malt, rhubarb, and potato leaves, coltsfoot and other plants, British tealeaves, &c. These adulterants are principally detected by the microscope. Amongst the mineral adulterants, the most injurious to health are the salts of lead; and if some of the others, such as salt, red ochre, chalk, lime, silica, &c., are not so injurious, they nevertheless defraud the revenue of considerable sums annually. 18. Hamburgh wine, a sophisticated wine, made to imitate sherry, and at one time extensively imported from Hamburg and other German port. This fraudulent practice is now, however, much checked. 19. Cadiz sherry wine of low quality, containing 50 per cent. of proof spirit, used for the fortification of wine to suit the English markets. 20. Methylated spirit purified from oil by a process patented by Mr. J. Watson Burton, of Leeds.

FRENCH INDUSTRY AND THE TREATY OF COMMERCE.

The following memorandum, issued by the Board of Trade, exhibits the progress of some of the most important branches of French industry since the conclusion of the Treaty of Commerce with Great Britain in 1860:—

It was loudly and constantly urged by the French Protectionists that the Treaty of Commerce between Great Britain and France, in 1860, would, by inundating the French market with British manufactures, effect the destruction of some of the national industries of France.

The extent of the difference between the thus anticipated and the actual results will be broadly shown by the following statements, the figures of which are entirely obtained from the French official returns.

It may be premised that, for general purposes of demonstration, one of the best indications of the prosperity of a national branch of industry is the increased extent to which the products of that branch of production are exported, as well as that of the importation of raw material, in cases where the manufacture is not incident to an article of native produce.

It may also be assumed that the extinction of exportation must generally precede the cessation of production for home consumption.

Judged by these, the only true standards applicable to such a question, we find conclusive evidence of the complete unsoundness of the Protectionist doctrine, whether we examine the aggregate or the special exports of France before and since the conclusion of the treaty in question.

The total value of exports from France of objects of French manufacture generally during the period from 1859 to 1864 have been as follows:—

	Francs.
1859	2,266,400,000
1860	2,277,100,000
1861	1,926,300,000
1862	2,242,700,000
1863	2,642,600,000
1864	2,924,200,000

Representing an increase of 657,800,000 francs for the year 1864, as compared with the first year of the period, whilst a glance at the return shows how little spasmodic is the character of the increase.

If we examine some of the constituent items of the above statement, the return is no less satisfactory to those industrial interests of France which it was presumed were most exposed to injury by the treaty.

With regard, first, to the French textile manufactures, the figures appended will show that those branches, viz., cotton, woollen and linen, of the industries, which were believed to be most vulnerable to free trade, and likely to suffer most from the action of the treaty, have maintained not only a regular increase, but have, in certain cases, made a starling progress.

COTTONS.

Value of exports from France of woven cotton goods of French manufacture during the following years:—

	Francs.
1859	67,200,000
1860	69,600,000
1861	56,400,000
1862	63,300,000
1863	88,200,000
1864	93,700,000

ing an increase of nearly 26,000,000 francs during a riod of unexampled disturbance of the trade, and in e of the unprecedented obstacles arising from the nerican war.

LINENS.

The development of the export linen trade of France also deserving of notice, especially under the circumances of its existence in a country which must import, most entirely, its supplies of the raw material from e two great flax-producing and linen manufacturing untries of Europe, viz., Great Britain and Belgium.

Value of exports from France of linen woven goods of rench manufacture:—

	Francs.
1859	15,400,000
1860	15,400,000
1861	14,900,000
1862	14,700,000
1863	19,000,000
1864	24,500,000

howing an increase of more than 9,000,000 francs, or ore than one-half.

The woollen industries of France, which it was held uld be annihilated by the treaty, have prospered, since 860, in a most remarkable degree, the exports having bsolutely almost doubled since that year, as is shown y the following statement.

Value of exports from France of woollen woven goods French manufacture:—

	Francs.
1859	180,600,000
1860	229,300,000
1861	188,000,000
1862	221,700,000
1863	293,600,000
1864	355,900,000

It may be as well to mention that this industry had en almost stationary in France during the six preceding ars.

YARNS.

The increase in the exportation of yarns is no less remarkable than that indicated with regard to the woven ods.

These are the amounts for the respective years:—

	Cotton and Woollen. Francs.	Hemp and Flax. Francs.
1859	6,900,000	1,000,000
1860	10,300,000	2,300,000
1861	7,600,000	1,600,000
1862	14,200,000	3,100,000
1863	17,100,000	26,600,000
1864	21,600,000	21,500,000

The above figures do not need comment as to the comrative effect of the treaty on the French producers of rns; the statement is most conclusive.

It is, perhaps, almost unnecessary to observe that, in e period under review, the prices of all the above ticles have been unusually high, and have therefore nded to check the natural development of the trade.

METAL GOODS.

Instead of destroying the metallic industries of France, treaty has unquestionably tended to promote them. must be borne in mind that France is by nature less lowed than probably any European country with the cessary capability, as respects native material, of suprting foreign competition in this particular industry.

The exports of metal goods, excluding machinery, have en as follows:—

	Francs.
1859	43,700,000
1860	45,700,000
1861	39,700,000
1862	41,900,000
1863	43,700,000
1864	45,100,000

Of machinery the following have been the exports during the corresponding period:—

	Francs.
1859	6,800,000
1860	8,300,000
1861	7,300,000
1862	8,300,000
1863	7,500,000
1864	9,500,000

CHEMICALS.

In estimating the value of the above figures as indications of the progress of this trade, it may be remarked that the value of the exports for 1859 were very considerably above the average, in fact largely in excess of the export of any previous year.

Notwithstanding the very extensive reductions effected by the French Tariff of 1860 on chemical products, the exportation of such articles of French manufacture has, by its large increase, triumphantly refuted the protectionist prophecies.

These are the figures:—

Value of exports of chemicals of French manufacture:—

	Francs.
1859	32,700,000
1860	35,400,000
1861	36,600,000
1862	54,400,000
1863	49,300,000
1864	54,400,000

FISH.

It will be doubtless well remembered that the question of the reduction of the French duties on fish created a memorable discussion, in which other than the simple commercial interests were involved, as it had been held that the prohibitory nature of the tariff meant protection to the Imperial navy, as well as to the fishermen of France. The results of the reduction are here exhibited.

Value of French salted fish, &c., exported.

	Francs.
1859	11,500,000
1860	8,800,000
1861	13,000,000
1862	11,900,000
1863	16,100,000
1864	15,200,000

The amount exported in 1859 was unusually large, a remarkable fact considering the variable nature of the fishing seasons.

It has here been most plainly shown how rotten was the foundation of the Protectionist doctrine, that French manufactures would go to the wall when subjected to the competition which would result from the treaty. The issue, instead of destruction to the French manufactures, has been, by the removal of encumbrances (some of which, being indirect in their pressure, were not assignable with precision), to enlarge the extent to which France was able to meet competition, not only in her own, but actually in foreign markets, to an extent and with a rapidity that the most sanguine expectations could have hardly anticipated.

In conclusion, it may be observed that, since France inaugurated her free trade movement by the reduction of her tariff on British manufactures consequent on the treaty with Great Britain, her Government has, with the almost entire approval of the French nation, made constant efforts to establish similar relations with other countries.

Practically this may be regarded as the most satisfactory evidence of the results of the abolition by France of protective Customs duties; the figures above given show how sound the conclusion is.

If we proceed to examine the figures of the exportation from France to Great Britain of the articles in question, the result is still more striking. Instead of the French market being inundated with British manufactures of

these kinds, the amount exported from France to the United Kingdom has vastly increased, as the following figures will most plainly indicate.

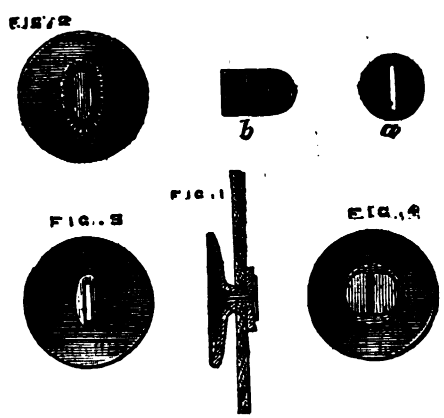
Real value of the following articles of French manufacture exported from France to Great Britain in the years 1859-64:—

	1859. Francs.		1864. Francs.
Woollens	39,178,000	..	98,512,000
Linens	3,331,000	..	3,103,000
Cottons	5,742,000	..	12,671,000
Metal goods ..	4,395,000	..	8,912,000
Yarns	406,000	..	8,842,000
Earthenware, Glass, &c., ..	4,398,000	..	5,998,000
Fish, salted, &c.	1,061,000	..	3,213,000

Thus it has been most distinctly shown, not only that the industries which the treaty was to annihilate have acquired a higher position than ever, but that the relations of those particular industries towards Great Britain have made a progress and assumed an importance unknown previously to the existence of the treaty, to which it may be without hesitation be alleged they owe mainly the extraordinary development they have since attained.

SELF-FASTENING BUTTONS.

Numerous attempts have been made at various times to introduce a method of securing buttons on clothing which should supersede the process of sewing. Hitherto the object has not been effected, owing to several drawbacks which have arisen to bar the practical application of a mechanical fastening. Mr. H. W. Hart proposes to overcome this by an invention he has just made, which consists in constructing buttons with shanks formed of a strip of metal or wire, upon the principle of Hart's well-known paper fastener, and provided with a washer made with an aperture just large enough to allow of the two plates of the shank when in contact passing through it. The plates or wires are of such metal as allows of their being bent without breaking. Fig. 1 of the accompanying engraving is a section of a button constructed



according to this invention and applied to a piece of cloth; figs. 2 and 3 are views of two different sides; fig. 4 shows the button with a washer; *a* is the washer, and *b* is the metal plate forming the button shank. To attach the button, remove the washer *a*, insert the shank *b* through the material to which the button is to be fixed, apply the washer and pass it down the shank, separate the two plates or wires of the shank *b*, and turn them down close on the washer *a*, as seen in fig. 1. For the sake of neatness, the length of the plates of the shank *b* should be such that when bent down on the washer *a*, they should not extend beyond its edges.

Fine Arts.

Picture Cleaning: National Gallery.—During the recess, while the National Gallery has been closed, several pictures have undergone the process of cleaning. It is now a considerable time since a like attempt was made. Thirteen years ago no less than 14 pictures were consigned to Mr. Seguier, of which number 12 were actually cleaned during the summer vacation of six weeks. The operation led to a Parliamentary inquiry and considerable public discussion. Sir Charles Eastlake, then President of the Royal Academy, and ex-officio trustee of the National Gallery, gave before the committee the following evidence:—"I consider the pictures were in a state to require cleaning, but I should not have recommended them to be cleaned, nor did I. Since I have been a trustee propositions have been brought forward almost periodically for cleaning pictures, and I have always opposed such propositions." The question was then asked, "On what ground has such opposition been made?" To which was given the following reply: "Because the cleaning of pictures is a subject which admits of no proof, and it is one on which the public mind may be easily unsettled. It was not because I thought that the pictures did not require cleaning." This evidence may explain why there was so little picture cleaning under the directorship of the late Sir Charles Eastlake. It may also be received in proof of the generally admitted fact that many pictures in the national collection require cleaning. Two years ago an intermediate method, known as "the Pettenkofer Process," was used "for refreshing the varnish" of certain pictures. But though in this process the "partial opacity in the superficial varnish" was overcome, the old varnish still remained, and with it necessarily some dirt. The method this year applied to certain other pictures is more thorough; it differs indeed but little, if at all, from the process long employed by picture cleaners. Its effect on a "Landscape with Mercury and the dishonest Woodman," painted by Salvator Rosa two centuries ago, has been examined. This picture, which thirty years since was purchased for the National Gallery, is now seen for the first time distinct in detail, and transparent in shadow, in a condition not very different from that in which it left the artist's easel. Salvator Rosa painted with a firm hand, solidly; he used sparingly, if indeed at all, thin glazing colours. It is just such pictures that can be cleaned with impunity. Other works which have also been in the cleaner's hands will speak for themselves on the approaching re-opening of the gallery.

Winter Exhibitions.—The Institute of Painters in Water Colours, following the example set by the elder society, will open a first winter exhibition for sketches and studies, by members and associates, on Monday next. On the same day Mr. Gambart commences his annual winter exhibition of cabinet pictures of British artists in the French Gallery. Also, on the same day, Mr. Wallis opens his annual winter exhibition in the Suffolk-street Gallery, and Mr. McLean a second annual exhibition in the Haymarket. On the following Monday, 12th November, will open the second winter exhibition of water-colour drawings in the German Gallery. The private views of these several exhibitions are on the Saturday which precedes the public opening.

British Museum.—A guide to the first vase room has recently been issued by Mr. Newton, the keeper of the Greek and Roman antiquities. The vases themselves have been critically examined and chronologically arranged, and many labels are attached, which, by determining dates, subjects, and styles, facilitate study. Those who are acquainted with similar collections in Naples, Florence, and other cities, having felt the need, will know how to estimate the advantage of such aids. There are few greater difficulties in art or archæology than those which beset the student of Etruscan, or

rather, Greek vases, and yet few lines of investigation offer greater pleasure or reward. When the re-arrangement of the collection, now far advanced, shall be complete, there will probably be no place in Europe where such studies can be prosecuted with the same facility as in the British Museum. In Naples may be found a magnificent collection in confusion, but Italian antiquaries want the knowledge and critical accuracy needful to elucidate the treasures dug from their own soil. Mr. Newton has classified the Greek fictile art in our Museum under the three following periods:—1st, the Archaic, extending from the commencement of Greek civilization to B.C. 440; 2nd, the period of finest art, from B.C. 440 to B.C. 336, the date of the accession of Alexander the Great; 3rd, the Macedonian period, from B.C. 336 to B.C. 100, about which time the art of painting vases probably ceased to be practised. The vases, which, in the first room, are mostly from Italy, have been placed in unbroken chronological series. It has been thought, however, desirable that the classification based on time should be supplemented by one of locality. Therefore the Athenian, Sicilian, and Rhodian vases have been arranged separately, in order that the student may more clearly distinguish the local peculiarities of style.

DECORATIONS OF THE TUILERIES.—Some time since mention was made in the *Journal* of the elaborate decorative works executed for the Pavilion of Flora, the corner tower of the Tuileries facing the river, and the wing which will connect the pavilion with the gallery of the Louvre, both of which have been entirely rebuilt within a comparatively short period. The former notice had reference principally to the river front; the following refers to the façade looking upon the great court of the palace, and the Place du Carrousel, which has just been disembarrassed of its scaffolding and thrown open to public view. The two stories of this building contain thirty-six niches, and each is filled with a statue. The following is the list of subjects with the names of the sculptors:—"A Flute Player," by M. Lévêque; "A Labourer," by Iguel; "A Greek, and an Etruscan Warrior," by Grugère; "A Slinger," by Forgeot; "The Wrestler," by Marcelin; "Castor and Pollux," by Petit; "Meleager," by Travaux; "Adonis," by Allasseur; "The Vintager," by Denécheau; "A Roman and a Frank Warrior," by Robinet; "Mercury," by Chambard; "A Fisherman and a Shepherd," by Chevalier; the above are all on the lower floor. On the upper story of the building are the following:—"Terpsichore," by M. Millet; "Abundance," by Prouda; "Minerva," by Maillet; "Ceres," by Chatrousse; "A Nymph, and a Naïad," by Salmson; "Pandora and Psyche," by Pollet; "Female Bather, and Fisher," by Cabet; "Hebe, and Daphne," by Oudiné; "Melpomene, and Euterpe," by Crank; "Erigone, and Circe," by Schœnewerk; "An Amazon," by Klagmann; "Venus," by Loison; and "Clio and Erato," by Soitoux. These statues are executed in stone, but they were entrusted to eminent artists; fifteen of the sculptors engaged in this elaborate decoration have received all the honours that the fine art juries have to give, four others are medallists, and only six are without such distinction.

Manufactures.

NEW COLOURING MATTERS AND PROCESSES.—In the application of indigo to dyeing it is necessary to render it soluble in alkaline and caustic mixtures by admixture with other substances; the reduction thus effected changes the colour of the indigo, which, however, is brought back afterwards by exposure to the air, of which it absorbs the oxygen. This process is accompanied in practice by serious difficulties; thus, if the indigo is reduced by fermentation with vegetable matters in a caustic ley (as in the hot process) the various acids resolved during the fermentation combine with the alkali, and the mixture ceases to be caustic, and no longer holds the reduced indigo in solution, so that the dyer is compelled to add from time to time small quantities of potash, soda, or lime; but if the addition is too small, a portion of the indigo is lost by decomposition, while if it be too great, a part of the indigo combines with the alkali, and forms an insoluble compound. M. Leuchs, of Nuremberg, says that all the difficulty vanishes by the use of *pectine*, for the conversion of the indigo. Pectine may be obtained in considerable quantities from radishes, citron, melons, and other vegetables and fruits, and these may even be employed in the place of the extracted pectine itself. The most simple form of the process recommended is to suspend an iron net or basket containing 20 pounds or so of fresh radishes cut into small pieces, in the hot caustic solution containing the powdered indigo, and then to continue the heat gradually to the boiling point. The indigo, it is said, soon loses its colour, and the solution, diluted with water deprived of its air, is ready for dyeing with. It is necessary, however, to avoid contact with the air as much as possible. When the dye stuff is exhausted it may be renewed by adding a little fresh indigo and caustic soda, and boiling, as before with radishes. The simplicity and efficacy of the process may be thus illustrated; place a small quantity of powdered indigo, dissolved in a few drops of caustic potash or soda, in a test tube, and, adding a small piece of radish, let the mixture boil; the indigo will rapidly lose its colour and be dissolved, but on exposure to the air will soon recover its original tint. As radishes cannot be had in all seasons, M. Leuchs has succeeded in extracting all the active principles by boiling the roots in water under a pressure of two or three atmospheres. It is said that the extract of radish has already become an article of commerce. Two German chemists, named Martius and Griess, are said to have discovered a new basis, which they call amidodiphenylimide; this substance with the impossible name they believe to be identical with the aniline yellow obtained by the action of stannate of soda on an aniline salt; it dyes silk and wool of a citron colour, and, in combination with picric acid, gives a cochineal-like red to wool; when heated with aniline it produces a blue dye. It is prepared in the following manner:—A mixture composed of three parts of stannate of soda, one part of nitrate of aniline, and ten parts of water, with the addition from time to time of caustic soda, is heated to boiling point. As soon as a drop of the liquor becomes intensely red when acidified, the operation is stopped and the mixture allowed to cool. When oxide of tin in chlorhydric acid is added, a reddish brown resinous deposit is thrown down, which is dissolved in caustic soda, for the purpose of taking out the traces of phenic acid. Finally a liquor is obtained which is filtered, and to which a little ammonia is added to precipitate the amidodiphenylimide. For dyeing purposes this base is dissolved in a weak solution of chlorhydric acid. M. Tissandier has given much attention to the residue left in the retorts used for the production of gas from apple refuse, and has produced from it, by distillation, amongst other matters, a new colouring substance resembling aniline yellow. The colour is obtained by treating the residue in question with ordinary nitric acid, and is entirely soluble in ammonia and in alcohol, but only partially in water. The aqueous solution may be used as a dye without any mordant. The colour is said to be perfectly fast.

COMPOSITION OF VARIOUS MARBLES.—The Society of Emulation of the Jura sometime since placed in the hands of M. Ch. Mène a collection of calcareous products of that locality for analysis, and that gentleman has extended his examination to the fine marbles of the country, which are extensively used in France. The principal specimens, of which the analyses are published, are the marbles of Molinges, Molessard, Saint Amour, Crans, Chassal, Saint Ylie, Consance, Villette les Cornod, Pratz,

Damparis, and Nantey, and the similarity of the composition of these marbles is very striking. With the exception of one or two samples the proportions of the main elements are almost identical; the amount of lime varies only within the limits of 505 to 550 parts in a thousand, and that of carbonic acid between 397 and 433. The quantity of clay has a wider range, one specimen containing only ·004, and another ·076, but in a sample of the grey marble of Rotalier, M. Mène found no less than ·150 of clay, but he considers that this belongs to the inferior oolite, and cannot possess much durability. The colours of the Jura marbles are very various, ranging from light grey to dark red, but the colouring matters vary but little; thus we find in the analysis of the yellow marble of Molinges ·002 parts of peroxyde of iron, while the violet-coloured marble of the same locality exhibits ·005 of the same substance; the yellow marble of St. Amour gives ·009 oxyde of iron, while the rose and violet coloured varieties of the same district give almost precisely the same results, while a fourth variety, a veined marble of a deep red colour, exhibits only ·005 of the same. In other cases the oxyde of iron amounts to ·022, while in others there is no trace of it, or very slight traces. In three instances the iron takes the form of peroxyde or protoxyde, in proportions varying between ·002 and ·005, and in one case both are found together. Seeing that the analyses are all quantitative, and that the loss rarely exceeds ·005, and in several instances is nothing at all, it is evident that the great variety of colours cannot depend solely on the presence and proportions of the metallic salts, especially as they all have iron for their basis. There is only one other element in the analyses to account, materially, for the variety of colour, namely, organic matter; but out of twenty or more cases more than half present no trace of such substances, and in the other instances the proportions are extremely minute, ranging only from ·002 to ·008. The varying tints of these marbles, which include grey, yellow, rose, violet, and deep red, offer an interesting problem for the mineralogist — is chemical analysis incapable of detecting the minute matters which cause these great differences in colour, or have the agents disappeared, and left only the marks of their presence in the various tints? One kind of Jura marble, that with veins and stains varying between yellow and brown, has been largely used in Paris for the balustrades of bridges, basins, and other parts of fountains, plinths, steps, and other purposes, and its warm tint presents a very effective contrast to white stone and harmonises well with bronze in the case of candelabra. M. Mène speaks of one of his specimens, the marble of Molessard, as presenting a very singular effect; the colour is yellowish grey, and the surface, when polished, presents a great variety of fossils, as well as calcareous crystals; he thinks it well adapted for small objects. The museum of Lons-le-Saumier possesses a collection of specimens of the marbles of the Jura, which are locally classed, according to colour, under the arbitrary names of deep yellow brocatel, or gilt Arabic, light yellow brocatel, violet and rose brocatel, *Jaune fleuri*, *Jaune Lamartine*, and *Jaune rosé*. An important work by the Rev. Father Ogerieu, Director of the Superior Schools of Lons-le Saumier, who was entrusted with the work by the Consul-General of the department, is now in the press, and will give full information on the geological formation of the Jura, and on the extent of the quarries where these marbles are found, together with the analyses of M. Mène.

Commerce.

The West India Sponge Fishery. — At present, perhaps owing to the large reduction in the collection and exportation during the late war in the United States, the supply of Bahamas sponge is not equal to the demand, and prices rule high. In the ten years ending 1864 the average export was 3,330 cwt. per annum, valued at £17,369. But four or five years ago as much as 5,000 to 6,000 cwt. were shipped from these islands. Bahamas sponge is inferior to the Mediterranean kinds, and a quarter of a century ago it was of little value. It was simply classed as coarse and fine, the former including the qualities now known as velvet, sheepwool, and grass, and selling for four to five dollars the cwt., the fine, or glove sponge, at 10 dollars. Now it is divided into the eight following classes, to each of which is affixed the average price per lb. which it fetched in 1864:—1st, common, or boat sponge, with white or yellow tissue, called in the island sheepwool, and in America carriage sponge; 2nd, common, or velvet sponge, with brown tissue; 3rd, large fine brown (fine hard-head), all these three 1s. 8d. per lb.; 4th, large coarse brown (coarse hardhead), 10d. per lb.; 5th, common coarse, or grass sponge, 4d. per lb.; 6th, large fine, soft tissue, not strong, called glove sponge, 4d. per lb.; 7th, small fine, soft tissue and good forms, called beef sponge, 2s. 6d. per lb.; 8th, small fine, hard tissue (small fine, hard-head, or hard brown) best quality, also often called beef sponge, 1s. 3d. per lb. Of late years sponge has been applied to a great many new purposes. The price of some qualities has doubled, of others quadrupled, and of some, such as velvet and sheepwool, for which apparently there could have been no foreign demand, the price is ten times greater than formerly. Large quantities of all the above kinds are sent to the United States, of the velvet and glove sponge to England, while France takes the finest qualities. They there undergo a final operation of cleaning and dyeing.

Vegetable Matters used by the Chinese in place of Soap.—M. Paul Champion, an engineer of the Ecole Centrale, who has recently returned from China, has brought with him a collection of substances and products in common use in that country, but which present certain points of interest in Europe. Amongst the rest are the fruit or seed pods of a leguminous plant from Shanghai, which are commonly used in several provinces in place of soap. The greater part of the epicarp is removed with a knife, and the wet linen is then rubbed with the peeled pods. The subject is an interesting one, and M. Payen, the chemist, has examined the specimens brought home by M. Champion, and has reported upon them to the Academy of Sciences. The fruits or pods in question vary in length from two to three inches, and sometimes exceed the latter, and in width from an inch to an inch and a quarter, being about the size of the pod of a Windsor bean; they contain from two to five globular seeds, of a brown colour; and M. Decaisne, of the Institut, considers the plant producing them to be a *[illegible]*. M. Payen has examined these pods minutely, with the aid of the microscope and chemical tests, and says that they possess some remarkable peculiarities; the pericarp contains several principles very distinctly marked, such as grains of starch, azotised fatty and mineral matters, and saponine, or a substance closely resembling it, which produces a lather by agitation with water, and is soluble in alcohol, especially with the aid of heat. The substance in question has the same property as soap, of insinuating itself with the aid of water between the fibres of fabrics and of destroying the adhesion between them and any foreign matter; in short, the pods produce, in a very economical manner, a part of the effect of common soaps. The seeds of the plant, which have a very hard brown envelope, present, scientifically, curious peculiarities in the perisperm which surrounds the embryo plant, and which differs in many respects from those of other leguminous seeds; and M. Payen has given the name *[illegible]* to the peculiar element which he believes he has discovered in its composition. M. Champion also brought another pod from China, which is used for the same purpose; this belongs to the family of the *Gleditschia*. These pods are much longer, measuring from six to eleven inches, but generally less than an inch in width. the seeds are of a reddish colour, and become loose when

ipe; whereas those of the kind described above are ixed firmly to the fibres of the pod; and the composiion of the pod is different in many respects. It contains 10 starch, and the envelope of the seed is different in nore than one respect, but it has a perisperm which losely resembles that of the seeds of the dialium, and he puffy portion of the pod possesses the same principle nalogous to saponine. In conclusion, M. Payen oberved that apart from the economical application alluded o, these pods exhibit the somewhat rare peculiarity of a iew secretion found in a peculiar tissue of a perisperm, emarkable both as regards its structure and composition. f M. Payen is correct in his deductions, and his authority n such matters is great, this saponaceous principle may robably be found in the pods of other leguminous plants.

THE BEET SUGAR CROPS.—The *Journal des Fabricants le Sucre* sums up the prospects of the French crop as folows:—"The falling off in the quantity of roots will be nuch less than was at one time feared, but on the other and the yield of sugar will be considerably below the stimates. The average yield of sugar in 1865-6 was ½ per cent. This year the yield will hardly be 5 per ent. It is then probable that our lowest estimate of 00,000 tons will not be exceeded, and it will not be eached if the bad results obtained hitherto prove to be eneral." Of the Russian crop, Herr Robert Burger, of Iagdeburg, reports most favourably. He states that there an be no doubt that the yield will be much larger than n the preceding season, and this fact is of considerable nportance to England, as large supplies of refined ugar were sent from Holland to Russia last year, thus nding to support prices in our market. According to he same report the Polish crop will be 15,000 tons gainst 16,500 tons last season. The Russian crop, it ppears, is difficult to estimate, and a yield of 80,000 ns is as probable as one of 60,000 tons. The reports om the Zollverein are less favourable, and it is thought hat the yield may be less than the 200,00 tons named.

BEET SUGAR VERSUS CANE.—The *Produce Markets Review* says:—"Until very recently it was generally upposed that cane was preferable to beet sugar for reining purposes, but a contrary opinion appears to be ow gaining ground. It is well known, for instance, hat the Parisian refiners give higher prices for beet han they do for cane sugar, and the decision arrived at y our continental neighbours is said to be confirmed by he practice of the Clyde refiners. It is also evident hat even the London refiners are awakening to the fact f the desirability of using beet for refining purposes. t may seem remarkable that, notwithstanding its deiciency in sweetening power, beet sugar should, for reining purposes, be preferred to that from the cane, and hat it should actually give a greater yield of refined ugar. The question as to how this result occurs is ifficult of solution, but there can be little doubt that it is mainly caused by the imperfect manufacture of the ine. The principal reason of the superior preparation f beet root sugar is that the salts contained in the ot are extremely nauseous, and that unless they are oroughly eradicated, the sugar produced is altogether npalatable, besides being uncrystallizable. The beet ot manufacturers are therefore forced to prepare good igar free from salts; and this, to a great extent, inlves the absence of molasses, and fructose or glucose, , in other words, uncrystallizable sugar. The colonial rowers, on the other hand, are not forced to get rid of ie salts and other impurities, because they are not so auseous as in the beetroot; and their mode of manucture is extremely imperfect. Large quantities of unystallizable substances are left in the sugar in the iape of fructose or glucose, and these impurities necesrily diminish the yield of refined sugar. We cannot etter conclude our remarks on the subject of the manucture of cane sugar than by quoting a portion of a cture delivered by Mr. Fryer, at Antigua, last year:—'All heat above 140 degs. is capable of exerting an inirious effect, and this effect is proportionate to the duration of the heat—the continuance of the syrup for two hours, at any given temperature, would do just double the amount of mischief which would be effected by its continuance at the same temperature for one hour—and this mischief consists partly in the change of colour, and partly in the change of a quantity of syrup, or sucrose, into fructose, and this injury to the juice is aggravated by the fact that every particle of fructose in a mixed solution detains from crystallization nearly its own weight of pure sugar—or, in other words, it would be impossible after mixing equal weights in solution of loaf sugar and fructose to recover the former in a crystallized state—the changes produced by the atmosphere alone, without the action of heat, show the necessity of proceeding instantly to raise the temperature to the boiling point, and the concentration should be continued without loss of time. The results arrived at by the polarising saccharometer show the gradual and rapidly increasing change of cane sugar into fructose, from the simmerer through the coppers in succession to the tache, the extreme limits of the change being in one case 17 per cent. of the sugar present. Remembering what is said above of the entangling action of fructose, this would represent an ultimate loss upon the production of 34 per cent.'"

THE GERMAN BEET CROP.—Herr F. O. Licht, of Magdeburg, has the following remarks on the prospects of this crop in his Circular for the month of October:—At the commencement of the season opinions are naturally much divided as to the crops. There are several districts, more especially in the neighbourhood of the Saal, where the state of the weather of late has been decidedly unfavourable both to the quantity and the quality of the roots. In other parts complaints are made about the small roots and large leaves. My estimates of this year's yield, which I fixed at 200,000 tons of raw sugar from a beet crop of 2,500,000 tons, I still consider correct, as its accuracy is to some extent confirmed by the correctness of previous estimates. At present, prospects are in favour of a good average crop, so should there be after all a failure in quantity, it can only be, as many have conjectured, in consequence of the luxuriant growth of the leaves. It must, however, be borne in mind that the two previous crops were 15 per cent., or more, below the average. If we reckon last season's crop of 2,250,000 tons as 15 per cent. below the average, the crop this season will be about 2,500,000 tons. But even supposing the yield to be not quite so favourable as in the previous season, we shall still have a yield of 1 cwt. of raw sugar for every 12·5 cwts. of roots against 11·7 cwts. of roots last season. The following is the latest estimate of the European crop furnished by Herr Robert Burger, of Magdeburg:—

	1866-67. Tons.	1865-66. Tons.
Zollverein	200,000	185,000
France	200,000	275,000
Russia	125,000	100,000
Austria	75,000	68,000
Belgium	30,000	41,500
Poland	15,000	16,500
Holland and Sweden	5,000	4,000
Total	650,000	690,000

CAMEO SHELLS.—The several varieties of the so-called conch shells (species of cassis and strombus) with which the shores of the Bahamas Islands abound, form an important article of export thence, and their collection affords a useful means of employment to the maritime and littoral population. They are chiefly sent to France. In the last three or four years the collection was somewhat interfered with by the more stirring trade carried on from Nassau during the American civil war, and the quantity shipped was reduced to one-half. From 1855 to 1860 the average value of the shells exported was upwards of £2,600, but from 1861 to 1865 the annual average was below £1,000.

COMMERCIAL PROSPECTS IN SPAIN.—In spite of some partial inundations the harvest of cereals, the produce of wine, of dried grapes, and of oil has been abundant enough to permit of large exportations by the new line of railway recently opened for traffic. The mineral products, those of mercury at Almaden, of copper at Rio Tinto, in Andalusia, and those of argentiferous lead in the whole of the sierra of Almeria, continue to furnish good results. The approaching opening of the universal exhibition at Paris has certainly caused a salutary excitement amongst the industrial, artistical, and agricultural classes in the Peninsula, and it is easily seen that each one desires to figure there with honour.

SALT AND TOBACCO IN ITALY IN 1864 AND 1865.—The sale of salt in 1864 amounted to 1,283,560 quintals 43 kilogrammes, or about 126,480 tons; in 1865, the amount sold was 1,157,169 quintals 28 kilogrammes, or about 113,980 tons. The results from this are, that the individual consumption was six kilogrammes 828 grammes in 1864, and six kilogrammes 157 grammes in 1865, and a relative revenue to the state of 2fr. 30c. and 2fr. 34c. Although there was a decrease in the consumption the revenue was augmented by the raising of the duty. The sale of tobacco has given the following results:—In 1864 the quantity of tobacco sold was 122,818 quintals 17 kilogrammes; in 1865, 110,721 quintals 35 kilogrammes, thus showing a decrease of 12,096 quintals 82 kilogrammes, or about 1,200 tons. The individual consumption was 632 grammes in 1684, and 571 in 1865, and a corresponding revenue per head of 3·893fr. and 3·898fr. Compared with the quantities consumed in France, it appears that the average individual consumption in Italy is less than that of France by 67 grammes for snuff, and 203 grammes for cut tobacco, whilst, on the other hand, it is inferior by 68 grammes in cigars. Altogether the individual consumption is considerably less in Italy than in France.

TELEGRAPHS IN ITALY.—The general administration of the telegraphs has just published the total amount of the receipts from the beginning of this year to the end of July. This amount, compared with the corresponding amount of last year, shows an increase of 251,634 frs.; the receipts from the 1st of January to the end of July, 1865, being 2,659,993 frs., and 2,911,628 frs. for 1866. It may be remarked, besides, that the exchange of international correspondence, which for the first three months of 1865 produced 181,327 frs., in 1865 for the first three months produced 331,888 frs., being thus an increase of 150,552 frs. These amounts bear witness to the development of commercial relations, both between the various provinces in Italy and between Italy and foreign countries.

Colonies.

STATE OF SOUTH AUSTRALIA.—According to the Government returns it appears that during the year 1865 no less than 316,476 acres of country and suburban land were alienated from the Crown, showing an increase of 91,315 acres over the purchase of the previous twelve months, thus making the total area of purchased land in occupation on the 31st December, 1865, 3,210,290 acres, or 20·5 acres for each individual of the estimated population at that date. Ten years ago the average amount was 15 acres per head. The area of the counties proclaimed up to the present time is 18,576,000 acres, of which about one-sixth part has been sold. Nearly two-thirds of the purchased land are in the hands of freeholders. The enclosures of land progress favourably, the total extent now being 3,854,315 acres, an addition of 355,217 acres during the present year. Deducting the area of land under cultivation from the above quantity, the extent of fenced pasturage will be found to amount to 3,193,746 acres, an increase of 282,423 acres during the year. 72,794 acres additional land were brought into cultivation during the past season, showing a very large increase as compared with the previous one. The total area now under cultivation is 660,569 acres, as compared with 587,775 acres in 1864–5, showing an increase of 12½ per cent., whilst the increase during the previous year was only 5 per cent. Four acres of tilled land is the rate per head for each individual of the population, or twelve acres for every male of upwards of fourteen years of age. The total area of land sown last year with wheat was 410,608 acres, against 390,608 acres last season. The aggregate produce of the harvest amounted to 3,587,800 bushels, or 665,149 bushels below that of 1864–5, the yield per acre being less than in any preceding season, being only eight bushels 44lbs. per acre. During the previous seven years the average yield was twelve bushels. The extent of land upon which hay was cut was 101,966 acres, an increase of more than 50 per cent., but as the crop only yielded 17 cwt. to the acre, or nearly one-fourth less than in 1864–5, the gross produce only resulted in an additional yield of 12,075 tons, being 88,731 tons in place of 76,656 tons. In 1863–4 the average yield was 27 cwt. per acre; it will thus be seen that a serious deficiency has existed in the produce of fodder during the two past seasons, chiefly owing to the drought. 9,362 acres of barley were reaped, against 12,585 acres during the previous season, while the gross produce was only 130,760 bushels as compared with 207,022 bushels, the average yield per acre being 13 bushels 48lbs. against 16 bushels 16lbs. the previous year. A decrease of 2,221 acres in the quantity of land under oats appears, 2,872 acres having been sown, and the yield amounted to only 42,642 bushels, a deficiency of 32,493 bushels, the average being but 14 bushels 48lbs. to the acre. There was considerable increase in the quantity of lucern and artificial grasses cultivated, say 7,567 acres, against 2,639 acres last year. Peas appear in the return for the first time as covering 969 acres. The potato crop proved a failure, only 4,828 tons—being the produce of 2,775 acres planted—or but 35 cwt. per acre. Orchards and gardens cover 6,473 acres. Vineyards now extend over 6,629 acres. The number of vines planted is 7,361,863, of which 5,255,899 are in bearing. There is an increase of 11,094 horses; say, in 1865, 73,993; in 1864, 62,899. Goats have increased from 9,474 to 12,283; and pigs from 53,430 to 55,742; and poultry from 327,881 to 377,001. There are now depastured 158,057 head of cattle, and nine years ago there were 310,460; this decrease is owing to the droughts. During the past year (1864) this number was reduced from 204,892 to 158,057. The total number of sheep returned is 3,779,308, as against 4,106,230, or a decrease of 326,922 sheep, nearly 9 per cent. Instead of exporting large numbers of sheep, as in several previous years, the colony, in 1865, purchased in the neighbouring colonies, and the markets have been regularly supplied with its cattle from the Darling. In 1864 it exported 186,436 sheep more than it imported, but in 1865 the balance was 38,392 against the colony, and, deducting the first quarter of the present year (1866) 32,837 more. With respect to cattle, the excess of imports in 1864 was 408; in 1865, 6,456 head; and 770 arrived during the past quarter of the present year. These returns nearly all show a decrease in the average yield of crops, and in the quantity of cattle and sheep, which is owing to the severe droughts during the last two seasons.

AUSTRALIAN GOLD AT THE PARIS EXHIBITION.—It is intended to forward to the Paris exhibition a pyramid, representing the space which would be occupied by all the gold produced in Victoria during the last fifteen years. The height of the pyramid will be 50ft. 10in., and at the base it will measure 10ft. square. Its cubic measure will be 1,994ft., and it will represent a weight of 1,071 tons 8qrs. 12lbs., of the value of £140,000,000.

THE INTERCOLONIAL EXHIBITION.—It appears that the Melbourne people are sparing no expense in erecting a suitable building for this Exhibition, which is to be a permanent structure of large dimensions. It is in the form of a nave and aisles, the nave being 50 ft. wide and 50 ft. in height to the roof, and each aisle 16 ft. wide and 15 ft. high. In these aisles it is intended to have courts containing superior samples of different classes of manufactures as distinguished from the general exhibits in the same category. This large hall is supported by 20 columns of brick with stone foundations, the columns reaching 16 ft. in height. Next there is the vestibule; this room is of circular form, its diameter being 78 ft., its height to the apex of the roof 55 ft. On the other side of this vestibule, between it and the annexes, is a space of ground, to be planted with flowers and shrubs, and in which a fountain is to be kept playing. The northern annexe or wing is 171 ft. long and 25 ft. wide, with a square room of 25 ft. at each extremity for refreshment rooms. This wing will be devoted to an exhibition of the processes of the manufacture of various articles, and in it several branches of industry will be be carried on. These are to include quartz crushing, gold beating, silversmiths' work, cigar making, gas making, bookbinding, printing in colours, lithography, &c. The south wing will be similar to the north, and will be set apart for pictures, statuary, and works of art. The area available for exhibition will be about 38,000 ft., or double the space provided in the old building. These particulars show that the Victorian colonists are in earnest, and that they deserve the support of the other colonies. This is, in fact, not a Melbourne but an Australian movement, and Sydney and Adelaide will both have exhibitions in turn if they will but heartily cooperate now.

Obituary.

WILLIAM FISHER HOBBS.—This distinguished agriculturist died on the 11th of October, at his residence, Boxted Lodge, near Colchester, in his fifty-seventh year. Until within the last few years, when declining health compelled him to relinquish an active and laborious life, Mr. Fisher Hobbs was one of the most prominent agriculturists in England. He was a highly successful breeder of stock; farmed largely and well; and combined scientific knowledge with practical experience. He was one of the founders of the Royal Agricultural Society of England; for many years he had been one of the Society's Council, and there were few of its more important committees which were not indebted to his labour and keen powers of investigation. His promptitude and energy were on several occasions of great service to the Society, and through it to English agriculture generally. In the smaller sphere of his own county Mr. Hobbs was equally active and useful. Every county agricultural society formed during the last thirty years was more or less indebted to his assistance in its formation and management; and of the less pretentious labourers' friend societies he was the founder of those at Coggeshall and Earls Colne, and the promoter of several others. The anti-malt-tax also loses one of its most earnest and persevering advocates. He was never married. He had apparently a strong constitution, but the rupture of a blood-vessel brought on increasing debility, followed by partial failure of mind. He was elected a member of the Society of Arts in 1858.

Notes.

GEOLOGISTS' ASSOCIATION.—A *conversazione* will be held in the libraries of King's College, Strand, on Tuesday, November 6, at eight o'clock, when short lectures and demonstrations will be given. "Geology and Mineralogy," by Professor Tennant, F.G.S.; "Petroleum and Paraffin in connection with the Preservation of Animal Food," by Mr. T. Boverton Redwood, F.C.S.; the Graphotype Process of Engraving, by the Graphotype Company; Micro-photography, exhibited by the aid of the Oxy-hydrogen Light, by Mr. Highley, F.G.S., &c.; the Exhibition of Microscopes and Microscopic Geology, Fossils, and other interesting objects. Members of any of the literary scientific societies in London can obtain admission-tickets for themselves and friends from Mr. John Cumming, Hon. Sec., 9, John-street, Adelphi.

THE CATTLE PLAGUE.—It appears, by the return for the week ending Saturday, 20th October, that there is a continued decline in the prevalence of the plague. The number of attacks officially reported for the week is six; this is a decrease of five on the return of the previous week. Fresh outbreaks took place in three farms, or places where cattle are kept; the number that appeared in the last return was also three. There were four healthy cattle slaughtered during the week in consequence of having been in contact with diseased animals. The cases reported are for the following three petty sessional divisions of England, viz.—(Essex) Rochford, one attack: (Shropshire) Whitchurch, one: (Cheshire) Northwich, four. Since the first outbreak of cattle plague 1 in every 19 of the ordinary stock of cattle in Great Britain has been attacked, and out of every 1,000 attacks, the results of which have been reported, 862 animals perished. No cases of plague in sheep have been returned during the week; the total number reported as having been attacked up to the date of this return is 6,826.

TURTLE.—The value of the turtle shipped from the Bahamas is usually about £1,000 per annum, and of tortoise shell £300 to £400. The shipment of live turtle to the States declined during the civil war, and the inhabitants were driven to consume what they caught themselves. The flesh of the turtle is sold in the Nassau market like beef, and at the same price.

Correspondence.

THE ELECTRIC TELEGRAPH.—SIR,—As one of the few remaining members of the Society of Arts, as it was a quarter of a century ago, I was much pleased to read in the last number of our *Journal* the award of Sir I. Brunel and Prof. Daniell in the matter of the invention and introduction of the electric telegraph into this country. I well remember the efforts of Mr. Fothergill Cooke; his communications to the Society are recorded in the Transactions—and I have not failed to remark how entirely those in authority, who have recently been distributing honours, appear to have forgotten the two men, Cooke and Wheatstone, to whom the whole credit of the first introduction of the electric telegraph into use is really due; and I cannot but express a hope that the omission will be speedily rectified. My object in addressing you, however, is not to enter into the question of who invented the telegraph, but rather to ask the following question which has often been in my mind, viz., Would it be possible, and if so would it not be desirable, to collect for the use of the nation, during the lifetime of the inventors, a complete series of the telegraphic instruments which have been produced, and which have led to the production of the present simple and beautifully effective instruments? Wheatstone, Cooke, Varley, Siemens, Bain, Brett, Thomson, Bonelli, Hughes, Morse, and numberless other electricians are still living, and doubtless they and the representatives of the Telegraph Company, as also of the late Mr. E. Highton and other deceased inventors, would contribute from their stores, if the instruments so contributed were sure of finding a resting place in one of our national museums. If the idea is worth a moment's

consideration, I shall be obliged by the insertion of this in the *Journal of the Society of Arts*.—I am, &c., An Old Member.

Neumeyer's Gunpowder.—Sir,—I was much surprised to see, by the *Journal* of the 26th October, that Herr Neumeyer does not appear to be aware of the circumstance that his powder was known and used in France many years ago. I have had some by me made from the French formula ten or twelve years ago, and I find it as good now as when fresh made. It is composed of 49 parts of dry chlorate of potash, 28 of yellow prussiate, and 23 of refined loaf sugar, each separately reduced to fine powder in the dry state. The mixing may be performed at any time, either with a box sieve in the small way, or by means of three hoppers, so regulated that they shall empty themselves through one spout in exactly the same time. The properties of this white gunpowder are accurately described, but it is not mentioned that the ingredients, while separate, may be kept in bulk any length of time without the slightest fear of combustion, spontaneous or otherwise. Also that though the white gunpowder does not foul the gun with slimy carbonaceous matter, still it is necessary to oil it from time to time in order to prevent rust, and of course destruction of the surface. I have, however, often fired twenty or thirty rounds, quick time, without any inconvenience, the bullets from a small pistol going clean through a sheet iron target at the usual distance. This powder might be made by mixing the three ingredients in solution and evaporating to dryness, but in that state the result would be useless, because the powder then becomes detonating and explosive, and could not be handled with any degree of safety. It is expulsive power that is required to drive a bullet, and yet not burst the chamber.—I am, &c., Henry Reveley.

Oct. 29th.

To Correspondents.

Erratum.—In last week's *Journal*, p. 755, col. 2, line 23 from bottom, for "*actual* thoroughfare" read "*arterial* thoroughfare."

MEETINGS FOR THE ENSUING WEEK.

Mon ...Entomological, 7.
Farmers' Club, 5½. Mr. James Howard, "On Things in America."
Society of Engineers, 7. Mr. Thomas Cargill, "On the Railway Bridge at La Place de l'Europe, Paris."
Royal Inst., 2. General Monthly Meeting.
R. Inst. of British Architects, 8.

Tues ...Anthropological, 8.
Ethnological, 8. 1. Professor Huxley, "On the Skull of a Patagonian." 2. Mr. J. Crawfurd, "On the History and Migration of cultivated Fruits, in reference to Ethnology."

Wed ...Geological, 8. 1. Prof. Huxley, "On some Remains of Dinosaurian Reptiles from the Stromberg Mountains, South Africa." 2. Mr. J. Beete Jukes, "Additional Observations on the Geological Structure of North Devon and West Somerset." 3. Rev. W. B. Clarke, "On Marine Fossiliferous Beds of Secondary Age in Australia."

Patents.

From Commissioners of Patents' Journal, October 26th.

Grants of Provisional Protection.

Artificial stone cements—2470—G. E. Van Derburgh.
Cast iron—2607—T. Outram.
Dress, articles of—2577—S. Leather.
Ductile materials, shaping—1926—J. H. Selwyn.
Electrical apparatus—2623—A. H. Brandon.
Fibrous materials, preparing—2603—J. Conlong.
Fibrous substances, combing—2601—M. Mirfield and J. Scott.
Fire-arms, breech-loading—2187—W. E. Newton.
Fire arms, breech-loading—2544—T. Wilson.
Fires, extinguishing—2553—E. Casper.
Folding fencing—2595—J. Greening.
Funnels—2599—W. E. Gedge.
Furnace fire grates—2605—T. Vicars, sen., T. Vicars, jun., and J. Smith.
Furnaces and cupolas—2627—G. Hadfield.
Furnaces—2625—E. B. Wilson.
Garments, fittings—2517—H. A. Bonneville.
Gas—2400—A. R. Stark.
Heated air engines—2633—H. Messer.
Ladies' garments—2429—J. P. Robinson.
Liquid compasses—2360—A. Cairns.
Metal furniture—2613—G. Pitt.
Oil, lamps for burning—2575—E. Lichtenstadt.
Portfolios—2410—G. and E. Ashworth.
Preserved substances, cases for—2639—E. C. Dawson.
Printing rollers—2615—E. Peyton.
Purses, &c., fastenings for—2579—W. Clark.
Railway trains, preventing injury to persons in—2621—W. Maby.
Rooms, heating—2647—W. Clark.
Sewing machines—2611—C. A. McCurd.
Soda waste, separating sulphur from—2593—G. T. Bousfield.
Stale bread, restoring freshness to—2587—J. H. Johnson.
Steam engines—2591—W. E. Newton.
Substances, mills for grinding, &c.—2618—J. Patterson.
Sugar and syrup, refining and deodorizing—2646—E. Beanes.
Tilt hammers—2583—W. E. Gedge.
Tobacco receptacles—2637—J. M. Bancroft.
Toys—2629—D. Rowe.
Trunks, &c.—2619—M. Myers.
Vapour baths—2631—R. H. Bollans.
Vessels, steering—2521—W. Clark.
Water meters—2581—A. Ripley.

Inventions with Complete Specifications Filed.

Cartridges—2739—W. R. Lake.
Gas burners, fixing draught apparatuses on—2679—J. Brown.
Jacquard looms—2693—W. E. Gedge.
Sewing machinery—2718—G. Haseltine.
Sewing machinery—2740—G. Haseltine.
Stage carriages—2678—W. Harvey.
Steam boilers, preventing superheating in—2687—G. Haseltine.
Washing machines—2688—J. Miller.

Patents Sealed.

1153. R. Stackhouse.
1156. G. F. Russell and W. H. Carbines.
1158. A. A. L. P. Cochrane.
1160. J. W. Burton.
1162. A. Upward & A. A. Cochrane.
1163. G. E. Noone.
1165. W. E. Gedge.
1166. H. C. Butcher.
1170. T. Kirby.
1171. S. Sequelin.
1174. A. Paraf.
1187. W. Soper.
1190. D. B. White.
1193. J. W. Hoffman.
1197. E. Bray & J. C. Hargreaves.
1200. D. Thomson.
1201. J. B. Robertson.
1202. D. R. Edgeworth.
1204. W. Sunderland and G. Spell.
1209. W. P. Piggott.
1210. W. Begg.
1220. J. H. Johnson.
1238. J. Morris.
1253. J. Botterill.
1306. B. Wright.
1325. J. Fletcher.
1341. J. H. A. Bleckmann.
1373. G. H. Bovill.
1430. J. Livesey.
1441. A. V. Newton.
2073. W. E. Newton.
2144. W. E. Newton.
2216. W. E. Newton.
2231. W. E. Newton.
1213. R. R. Riches and [illegible].
1214. A. Bernard.
1217. J. Baron and E. Taylor.
1219. C. D. Fox.
1221. W. Deakin & J. B. Johnson.
1224. J. Nisbet.
1225. J. Spencer and D. McCorquindale.
1226. G. Davies.
1227. G. Davies.
1228. J. V. Delestre.
1235. P. Gritton.
1257. S. Bourne.
1263. A. T. Becks.
1408. W. A. Lyttle.
1442. J. J. Margais.
1738. R. Hornsby.
1754. H. A. Bonneville.
1850. L. J. Crossley and J. Sunderland.

From Commissioners of Patents' Journal, October 30th.

Patents Sealed.

1230. J. Lewis.
1232. J. Thomas and A. Prince.
1236. F. F. Benvenuti.
1237. H. Moore, T. Sagar, G. Keighley, & T. Richmond.
1239. D. Cohen.
1244. A. A. Constalliat.
1246. W. H. Stanley.
1247. O. H. Ramsten.
1252. D. Urquhart.
1258. J. W. Post and W. McI. Cranston.
1260. E. Field.
1264. H. and J. Douglas.
1266. A. Morel.
1268. T., J. jun., J., & H. Bland.
1270. W. B. Bartman.
1274. J. G. Hope.
1275. J. H. Johnson.
1276. A. Rogers.
1278. W. Young and P. Bush.
1282. G. Davies.
1290. F. Washington.
1300. W. W. Crist.
1317. J. R. Swann.
1322. T. Thornton.
2170. W. E. Gedge.

Patents on which the Stamp Duty of £50 has been Paid.

2527. C. Fusnot.
2617. J. Ronald.
2677. J. R. Johnson.
2836. G. T. Bousfield.
2620. J. Parker.
2643. W. E. Gedge.
2657. E. R. Hollands.
2656. R. Smith.
2671. G. E. Donisthorpe.
2674. B. A. Brosseau.
2755. C. H. Southall and E. Heap.
2648. J. Marshall.
2655. F. B. O'Neill.
2658. W. and S. Firth and J. Sturgeon.
2672. R. B. Jones.
2743. L. Whitworth.

Patents on which the Stamp Duty of £100 has been Paid.

2448. J. W. Hackworth.
2461. B. A. Brosseau.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 9, 1866.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Thirteenth Session of the Society will commence on Wednesday, the 21st instant, when the Opening Address will be delivered by Sir Thomas Phillips, Q.C., F.G.S., Chairman of the Council.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock:—

1866.	November	—	—	21	28	
,,	December	5	12	19	—	
1867.	January	—	—	16	23	30
,,	February	6	13	20	27	
,,	March..........	6	13	20	27	
,,	April	3	10	—	24	
,,	May	1	8	15	22	29
,,	June	—	—	—	26*	

For the Meetings previous to Christmas, the following arrangements have been made:—

November 21.—Opening Address by the Chairman of the Council.

November 28.—"On the Effect of Unlimited Liability Partnership on the Progress of Arts, Manufactures, and Commerce." By William Hawes, Esq., F.G.S.

December 5.—"On the Trade in Foreign Cattle." By John Irwin, Esq.

December 12.—"On Old London: its Streets and Thoroughfares." By J. G. Crace, Esq.

December 19.—"On the Study of Indian Architecture." By James Fergusson, Esq., F.R.S.

A book of blank Tickets of Admission to the Meetings has been forwarded to each Member, who is privileged to introduce two friends to each meeting on their presenting orders signed by him. Additional tickets will be forwarded on application.

The Cantor Lectures for the ensuing Session will consist of Three Courses, the particulars of which will be announced in the *Journal.*

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade,* obtain the highest number of marks, with a certificate, in those subjects respectively.

* The Annual General Meeting: the chair will be taken at four o'clock. No visitors are admitted to this meeting.

National Musical Education.

The following circular has been forwarded to each member of the Society:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., October, 1866.

Sir,—I am directed by the Council to direct your particular attention to the two reports of the Musical Education Committee of this Society, appended hereto.* This Committee was formed early in the year 1865, and has ever since been actively engaged in promoting the object for which it was appointed. On reference to the reports, it will be seen that the Committee has collected the views and opinions of gentlemen who are among the chief authorities in the musical profession, whilst the names of those serving on the Committee show that many distinguished amateurs have been willing to cooperate with the Society. The Committee has also obtained valuable information relative to foreign musical academies; and has received much assistance in its inquiries from the Royal Academy of Music in this country. The proceedings of the Committee have, from time to time, been published in the *Journal*, for the information of the members of the Society.

The Royal Academy of Music has expressed its full concurrence in the views of the Committee, and its willingness to do all in its power to carry them out.

The Duke of Buckingham (as Lord President of the Council) has invited the Earl of Derby (as President of Her Majesty's Commissioners for the Exhibition of 1851), Earl Granville (as Chairman of the Finance Committee of that body), and the Earl of Wilton (as Chairman of the Royal Academy of Music), to consider an application made by the Academy for permanent premises.

The Council of the Society of Arts have resolved to establish, at the proper time, four such Scholarships as are recommended in the report.

The Council feel that the successful re-establishment of the Royal Academy of Music must depend upon the earnest and active support of the public, and they have resolved to call the attention of the friends of musical education to the subject, whether as individuals or public bodies, and to appeal to them for their co-operation. They have determined, in the first instance, to place the matter before each member of the Society, and to ask if he is disposed to exert his influence in promoting this important national work.

Should you be willing to assist the Council in this matter, I request you to favour me with a reply, in order that I may have the pleasure of entering your name on the list of those who desire to see this national object carried into effect with credit to the country.

I am, sir,
Your obedient servant,
P. Le Neve Foster, *Secretary.*

* See *Journal*, pp. 565 and 613.

Proceedings of Institutions.

City of London College.—On Tuesday evening, the 31st October, the prizes and certificates awarded by the Society of Arts and by the authorities of the College, were distributed at the College, in Leadenhall-street, by Sir Thomas Phillips, Q.C., F.G.S., chairman of the Council of the Society of Arts. There was a large attendance of the students, members, and friends of the college. The report, which was read by the hon. secretary, the Rev. J. Maskell, stated that, although not marked by any features of novelty, the year had been one of quiet and systematic work—of hopeful and steady progress. At the last examination of the Society of Arts, the City of London College, with its sixty-six candidates, gained no less than 17 prizes, and 33 first-

class certificates. This college has also obtained the Prince Consort's prize of 25 guineas for this year, in the person of Mr. J. Rigby Smith. The average number of students for the three terms exceeded 800; but the number of vouchers taken to enable many of these students to attend several classes exceeded 1,000. The result of the examination conducted by the college board of examiners in the month of July was equally creditable. Although but 65 candidates presented themselves for examination, to these 34 first-class, 22 second-class, and 22 third-class certificates were awarded. Prizes were obtained as follows:—For arithmetic, by H. B. Brain; for bookkeeping, by W. Carter; for chemistry, by A. Liversidge; for divinity, by S. W. Casserley; for English history, by A. Sarll; for freehand drawing, by C. E. Pearce; for mechanical drawing, by W. R. Mallett; for German, by J. S. Harding; the annual scholarship of £10, with free admission to the college for one year, allotted to the student who obtained the highest aggregate number of marks in any three of the subjects of examination, H. B. Brain; the Greatorex prize of £5, for proficiency in modern languages, J. S. Harding; the Lowth prize of £3, allotted to the student who had attended the classes most regularly in three of the subjects for examination, provided he obtain two first-class certificates, and his conduct and character be unimpeachable, H. B. Brain; the English essay prize (subject—Strikes and Lockouts) of £2, W. D. Cramp; the Goethe German essay prizes of £3 and £2, founded by the professor of German, Dr. Zerffi, for the encouragement of the study of that language. 1st—F. B. Evans; 2nd—W. Holman; the Payne prize of £5, founded by Mr. D. Payne, a member of the council, for promoting the study of chemistry, natural theology, and human physiology, J. Hughes; the Thompson prize of £5, given by Messrs. W. J. and H. Thompson, for proficiency in arithmetic and bookkeeping, H. B. Brain. Of the general character of the work of the examination, most of the examiners gave a favourable report. The financial position of the college was highly satisfactory. The balance-sheet showed that, after the payment of the previous deficiencies, there was an actual surplus of £29 2s. 6d.; and, besides that sum, there was a balance to the credit of the establishment fund amounting to £228 17s. 9d. Sir Thomas Phillips then proceeded to distribute the various prizes, and at the conclusion of this ceremony he delivered an address. He said he attended to-night to present these prizes and certificates with the greatest possible pleasure. He knew something of the circumstances under which this college originated, and had attained its present important position. He considered this college, for the class of persons to whom it was especially devoted, to be the most important movement of our time. The City of London College, although not in name, but substantially in form, was one of the first institutions which was started to enable the young men of that great city to improve themselves by attending evening classes. It was gratifying to know that this institution had succeeded. Success did not always follow in life even the best efforts or the best contrived designs, but it was impossible to look at the work done in this college during the past few years, it was impossible even to look at the rewards which had been conferred that evening without feeling that a very large amount of good was being diffused amongst the mass of this great city, and the most important results were being achieved. These evening classes afforded to all who chose to avail themselves of their advantages an important means of self-help, and facilities for ultimate advancement which otherwise might never come within their reach. But these classes had still higher claims and functions. By withdrawing the youth of a great city from temptations to which they were too freely exposed, and giving them habits of methodical study, they aided largely in the formation of character, and exercised a beneficial influence on society at large. He was also glad to know that the college had succeeded financially, because financial success was necessary in this life to secure the permanency of any labours. Sir Thomas Phillips concluded his address by a few appropriate words of advice to the young students whom he addressed. Mr. P. L. Simmonds then moved the following resolution:—"That this meeting, representing the friends and supporters of the City of London College, desires to tender its best thanks to the Society of Arts for the liberal encouragement received at their hands, as manifested by the prizes and certificates this day distributed." Mr. Knight seconded the resolution, which was carried unanimously, and duly acknowledged by Sir Thomas Phillips. Votes of thanks to the examiners and adjudicators for the services they had rendered, to the professors and educational staff of the college, and to the principal (the Rev. Mr. Whittington) were proposed and carried by acclamation. Mr. E. G. Clarke, in proposing the latter vote, drew attention to the fact that the examination held by the Society of Arts included 82 subjects, in nine of which the first places had been taken by pupils of the college. The proceedings closed with complimentary recognitions of the services rendered by Sir Thomas Phillips, who gave away the prizes, and the Rev. C. Mackenzie, who presided.

LANCASHIRE AND CHESHIRE UNION OF INSTITUTES.—CLITHEROE MECHANICS' INSTITUTION.—The annual meeting in connection with the above Institution was held on Monday, October 29th. The report stated that its success during the past year had never been surpassed since the establishment of the institution. The income had been £129 3s. 11d., the expenditure £119 19s. 3½d., leaving a balance in hand of £9 4s. 7½d. *Library.*—The number of issues during the year had been 2,602, being an increase of 73 over previous year. *Classes.*—The elementary classes for young men and young women had made great progress. A Government science class was established last winter, and had been very successful. *Results of Examinations.*—Elementary certificates had been obtained by four female candidates. Four certificates had been awarded by the Society of Arts. Six candidates had passed at the Government Science Examinations, held in May last, and certificates had been awarded by the Union of Lancashire and Cheshire Institutes to two candidates who had passed a special examination in social economy. In consequence of a grant of £400 by the Relief Committee, for the purpose of erecting a new institution, five trustees had been appointed, and the committee for the ensuing year were constituted the New Building Committee. The prizes and certificates were distributed by J. Mitchell, Esq., who made a few very appropriate and encouraging remarks to each successful candidate. Addresses were afterwards delivered by Messrs. J. Mercer, jun., Thomas Lawton, visiting agent to the Union of Lancashire and Cheshire Institutes, and William Gunn, Government Science teacher. Local prizes amounting to £4, were offered to the most successful candidates of the next year's examinations.

FREE TRADE AND THE REPEAL OF THE NAVIGATION LAWS.

The following Memorandum, issued by the Board of Trade, is intended to exhibit the progress of British commerce, navigation, and revenue during recent years, and to illustrate the results of the adoption by Great Britain of a system of commercial freedom, and the repeal of the Navigation Laws:—

Whilst the increase of productive power and other causes have, without doubt, materially operated in effecting the vast development indicated in this memorandum, these resources must have remained in a great degree unprofitable had the former restrictions on British trade and navigation been still maintained.

EXPORTS AND IMPORTS.

The official value of British and foreign and colonial

xports and imports combined were as follows, in the ears 1842, 1853, 1863, 1864, and 1865 respectively:—

1842	£179,095,088
1853	365,171,537
1863	485,027,040
1864	496,067,717
1865	545,873,160

Of these amounts the official values of the imports were—

1842	£ 65,253.286
1853	123,099,313
1863	171,913,852
1864	175,961,690
1865	181,806,048

During the same years the corresponding values of the exports of British and Irish and foreign and colonial merchandise were—

1842	£113,841,802
1853	242,072,224
1863	313,113,188
1864	322,106,027
1865	363,067,112

Of these amounts the official value of the proportion of exports of British and Irish manufactures, &c., was—

1842	£100,255,380
1853	214,327,452
1863	258,198,551
1864	267,150,982
1865	301,612,902

The real value of British imports can only be ascertained since the year 1854. In that year they amounted to £152,389,053, whilst in 1863 they had increased to £248,980,942, in 1864 to £274,863,924, and in 1865 to £271,134,969.

The real values of the exports from the United Kingdom in the years 1854, 1863, 1864, and 1865 were—

1854	£115,821,092
1863	196,902,409
1864	212,588,239
1865	218,858,316

The real values of these exports cannot be given previously to 1854, as such values of foreign and colonial merchandise were not ascertained until that year.

The real value of exports of British and Irish manufactures during the years 1842, 1853, 1863, 1864, and 1865 respectively, was—

1842	£ 57,381,023
1853	98,933,781
1863	146,489,768
1864	160,449,053
1865	165,862,402

The immense development of this branch of our commerce during recent years will be more readily appreciated when it is remembered that the figures for 1842 are but little in excess of the average value of our exports during the thirty preceding years.

In the years 1854, 1863, 1864, and 1865 the real values of our exports of foreign and colonial merchandise were—

1854	£18,636,366
1863	50,300,067
1864	52,139,186
1865	52,995,914

The quantities of the various principal articles of food below mentioned, and now admitted duty free, were as follows for the respective periods:—

	1842.	1853.	1863.	1864.	1865.
Horned cattle ....No.	Prohibited	125,253	150,898	231,733	283,271
Sheep .... "		259,420	430,788	496,243	914,170
Bacon and hams ....Cwts.	8,355	205,667	1,877,813	1,069,390	713,346
Butter .... "	175,197	403,289	986,708	1,054,617	1,083,717
Eggs ....No.	89,548,747	123,450,678	266,929,680	335,298,240	364,013,040
Rice ....Cwts.	511,414	1,504,629	3,070,292	3,187,650	1,941,580

The quantities retained for consumption of the following articles, which are still subject to Customs' duties, were:—

	1842.	1853.	1863.	1864.	1865.
Cocoa ....Lbs.	2,246,569	3,997,198	3,712,287	4,171,142	4,286,635
Coffee .... "	28,519,646	36,983,122	32,762,995	31,589,597	30,748,349
Sugar, raw ....Cwt.	3,868,437	7,272,833	9,202,524	9,189,127	10,187,146
Tea ....Lbs.	37,355,911	58,834,087	85,183,283	88,637,199	97,921,944
Tobacco, unmanufactured "	22,013,146	29,348,598	36,751,173	37,189,856	38,341,644
Wine.................Galls.	*4,815,222	6,813,830	10,422,105	11,456,531	12,061,386

The declared or real values of the more important articles of British manufacture exported during the same years are as follows:—

	1842.	1853.	1863.	1864.	1865.
	£	£	£	£	£
Apparel, haberdashery, and millinery................	1,143,270	6,923,190	7,169,975	7,376,970	7,653,706
Cotton yarn	7,771,464	6,895,653	8,019,954	9,083,239	10,351,049
" goods	13,907,884	25,817,249	39,424,010	45,799,090	46,903,796
Earthenware and porcelain....	555,430	1,338,370	1,334,275	1,422,014	1,442,934
Hardware and cutlery	1,398,487	3,665,051	3,826,784	4,334,273	4,334,273
Leather and leather wares	400,927	1,578,595	2,319,763	2,408,306	2,462,100
Linen yarns	1,025,551	1,154,977	2,535,728	2,991,969	2,505,497
" manufactures	2,346,749	4,758,432	6,509,970	8,172,813	9,155,358
Machinery	554,653	1,985,536	4,365,023	4,848,592	5,213,530
Iron and steel..............	2,457,717	10,845,422	13,111,477	13,310,484	13,451,445
Tin plates	363,685	1,181,069	1,311,850	1,263,246	1,482,766
Silk, thrown and manufactured	590,189	2,044,361	2,229,591	2,214,927	2,177,285
Woollen yarn................	637,305	1,456,786	5,065,432	5,417,377	5,424,047
" manufactures	5,185,045	10,172,182	15,518,842	18,533,497	20,102,259

* The importation of wine in 1842 was unusually small, the average importation from 1840 to 1848 having been nearly 6,500,000 gallons.

Notwithstanding the great increase here indicated with regard to British imports and exports, it must be borne in mind that few countries have yet comprehensively adopted a liberal commercial policy, and that, consequently, the measures in that direction, which have already been for some years fully applied by Great Britain, cannot be said to enjoy the conditions necessary to the complete development of the system.

NAVIGATION.

The tonnage of British and foreign vessels which entered and cleared in the United Kingdom with cargoes, in the years 1842, 1853, 1863, 1864, and 1865 respectively, was:—

	1842.	1853.	1863.	1864.	1865.
	Tons.	Tons.	Tons.	Tons.	Tons.
British	5,415,821	9,064,705	15,263,047	16,409,413	17,413,643
Foreign	1,930,983	6,316,456	7,762,116	7,065,471	7,572,202
Total......	7,346,804	15,881,161	23,025,163	23,474,484	24,985,845

The coasting tonnage of the United Kingdom has likewise increased greatly, notwithstanding the severe competition of the inland railway carrying trade, as is shown by the accompanying figures of the tonnage of British and foreign vessels engaged with cargoes in the coasting trade of the United Kingdom:—

	1842.	1853.	1863.	1864.	1865.
	Tons.	Tons.	Tons.	Tons.	Tons.
British	10,785,450	12,820,745	17,465,635	17,350,579	18,150,649
Foreign	None.	None	81,897	66,107	77,705
Total......	10,785,450	12,820,745	17,547,532	17,416,686	18,228,354

The tonnage of vessels built and registered in the United Kingdom in the years 1842, 1853, 1863, 1864, and 1865, was:—

	1842.	1853.	1863.	1864.	1865.
	Tons.	Tons.	Tons.	Tons.	Tons.
Sailing-vessels	116,213	154,956	253,036	272,499	235,555
Steam-vessels	13,716	48,215	107,951	159,374	179,649
Total	129,929	203,171	360,987	431,873	415,204

In addition to the above, the following amount of foreign tonnage was registered in the United Kingdom:—

	Tons.
1842	
1853	30,073
1862	74,629
1864	128,761

The total registered tonnage of the United Kingdom was in the same years:—

	Tons.
1842	2,990,849
1853*	4,030,204
1862*	4,934,400
1864*	5,627,500
1865*	5,760,309

The effective power of steam vessels being so largely superior to that of sailing vessels, lends considerable importance to the following figures of the steam tonnage on the register for the United Kingdom in the years 1851 and 1865 respectively:—

	Tons.
1851	186,687
1865	823,533

* The figures for these years include the registered tonnage of the Channel Islands and the Isle of Man, the amount of which may be estimated at about 100,000 tons.

CUSTOMS REVENUE.

The revenue produced by the customs has been well sustained, notwithstanding the great reductions effected in our tariff since 1842. In that year almost every article imported was liable to a Customs' duty, and the list of tariff denominations amounted to many hundreds, whilst at present 12 leading articles alone are taxed on importation.

The gross customs' revenue, after deducting drawbacks, &c., amounted in the following years to:—

1842	£22,523,513
1853	22,515,913
1863–64	23,234,356
1864–65	22,527,573
1865–66	21,302,239

During the same intervals the excess of reduction of customs' duty above the amount imposed was:—

1843–53	£10,166,749
1854–63	4,458,166

The reduction in the same branch in the years 1864, 1865, and 1866, is, for each year respectively:—

1864	£1,744,384
1865	2,214,981
1866	477,000
Total	4,436,365

The amount of additional customs' duties imposed during the same period was only £1,576, arising from the increase in 1865 of the duty on sugar-cane juice for assimilative purposes.

The actual excess of reduction for the whole of the three years was therefore £4,434,789.

Thus, during the whole interval the customs' duties have been reduced by £19,059,704, or more than four-fifths of the whole customs' revenue in 1842; the revenue produced exhibiting a decrease of merely £1,469,076.

EXCISE REVENUE.

The gross amount of the duties of excise in the years 1842, 1853, 1863, and 1864, were:—

1842	£14,616,083
1853	16,303,237
1863–64	18,207,000
1864–65	19,428,324
1865–66	19,818,162

The relative additions and diminutions during the same periods were:—

1842–53	£2,486,000	Reduced.
1854–63	1,226,000	Imposed.
Excess of reduction of Excise duty............	1,260,000	
Reduction, 1864–66	95,000	
Total	1,355,000	Reduced.

Thus, notwithstanding the various reductions of excise duties, amounting for the whole of the above period to £1,355,000, the revenue obtained in 1866 from this branch of the public service had increased by £4,812,241 over the amount for the year 1842.

The total gross receipts of revenue of the United Kingdom during the three years were as follows:—

1842	£52,765,147
1853	57,586,215
1863–64	70,208,964
1864–65	70,313,437
1865–66	67,812,292

The gross revenue had, therefore increased during the aggregate period from 1842 to 1865–66 £15,049,145, and that this increase was not due to augmented taxation is made evident by the following statement:—

Excess of Total Amount of Customs, Excise, and other Taxation Repealed over the Amount Imposed during the Periods 1842–53, 1854–63, *and* 1864–66.

1842–53	£7,175,986
1854–63	4,407,966
Excess of diminution	11,583,952
„ „ 1864–66	9,761,789
Total excess of diminution..	21,345,741

or about 40 per cent. of the whole amount of the revenue of 1842.

The expenditure of Great Britain, which amounted, in 1842, to £55,223,874; was in 1853, £55,769,252; in 1863-4, £67,056,286; in 1864-65, £66,462,206; and in 1865-66, £65,914,357.

In 1842 the amounts of the unredeemed funded and of the unfunded debt were respectively:—

Funded	£773,068,340
Unfunded	18,182,100
Total	791,250,404
In 1853—	
Funded	£761,622,704
Unfunded	17,742,500
Total	779,365,204
In 1863—	
Funded	£777,429,224
Unfunded	13,136,000
Total	790,565,224
In 1865—	
Funded	£775,768,295
Unfunded	10,742,500
Total	786,510,795
And on the 31st March, 1866—	
Funded	£773,313,229
Unfunded	8,187,700
Total	781,500,929

The whole amount of the funded and unfunded debt stands at present, therefore, at £9,749,511 less than the amount which it represented in 1842.

PRESERVATION OF WINE.

The following is from *Morgans' British Trade Journal:*

The changes in the tariff, the largely increasing consumption of French wine in England, and other circumstances, have materially contributed, and are still contributing, to improvements in the making and the means of preserving wine. The readers of this journal have been informed of all the principal experiments that have been made in this direction, and have had the benefit of various opinions, *pro* and *con*, expressed by those whose views on the subject deserved attention. In France M. Pasteur has certainly occupied the most important place amongst scientific men who have taken up the subject of the conservation of wine earnestly, and his experiments and conclusions have been recorded from time to time in our pages.

The matter has just now received further and very important consideration, and with a result, as regards the opinion of practical as well as scientific men, that commands attention.

Some time since the Central Agricultural Committee of Sologne, at the instance of its president, M. Boinvilliers, senator, voted a gold medal, of the value of a thousand francs, "to the inventor of a process, to be made public, and which should enable French wines to be conveyed by land and sea, and to be kept in any climate without alteration of their flavour or bouquet." A commission was appointed to examine the subject, and the report of M. Dumas, the well-known chemist, member of the Institute, and senator, is now published.

The commission declares that M. Pasteur's experiments and researches have fulfilled the conditions laid down, that they have thrown the greatest light on the causes which give rise to alterations in wine, as well as upon the practical means which may be used to prevent the mischief, with certain success.

The report goes on to say that M. Pasteur, by the aid of experiments conducted with a profound knowledge of the natural laws bearing upon the subject, and aided by an intimate knowledge of the scientific means to be employed, has perfectly succeeded in establishing the five following propositions:—

1. That the dangerous changes which occur in wine arise from causes which are mixed up with those to which fermentation is attributed.

2. That the heating of ordinary wine to the extent of 50° centigrade is sufficient to kill all microscopic vegetation, or the ferments which produce them; fermentation and all other dangers due to these causes being thus arrested or prevented.

3. The application of the amount of heat indicated does not in any way effect the colour or the flavour of wine, and assures brightness.

4. Wines which have been submitted to such temperature appear capable of being kept indefinitely in closed vessels.

5. When exposed to the air such wines, it is true, may become effected after a certain lapse of time; but this is in consequence of the air supplying them with the living germs of those ferments which they previously lost by the action of heat.

The report then gives the results of M. Pasteur's studies of the various maladies which affect wines:—

1. *Acid or Pricked Wine.*—This acid is due to the presence of *mycoderma acetic*, which must not be confounded with *mycoderma vini* (the true ferment), which does not produce any change in wine, while the former, with the aid of the air developes vinegar, and renders the wine, sooner or later, acid.

2. *Wine turned.*—Sick, out of condition, but not pricked, owe the change to filaments of extreme thinness, which resemble and sometimes appear identical with the filaments of lactic fermentation. M. Pasteur, as well as M. Balard, has also found wine affected by the presence of lactic acid, but this is an uncommon case. The filaments in question resemble those of lactic acid, and, like the latter, are composed of strings of small bodies like pieces of the stalk of wheat or bamboo, but by means of the microscope the signs of many distinct maladies may be detected in wine which have been confounded under the same names, but which have nothing in common but the fact of their being produced by similar microscopic vegetation.

3. *Wines that have become Oily or Ropey.*—The cause of this change consists also of filaments, but, in this case, they are composed of grains, and not of rings or tubes.

4. *Bitter Wine, Wine that assumes premature Old Age.*—This change is also produced by filaments closely resembling those of the second case, but finer and less refined in shape. The same wines are not, however, subject to the changes described.

All these parasitic growths, says the report, and others which have been observed but not yet scientifically examined and determined, are destroyed by a temperature of 65°, or even 50° centigrade. In heating the wine, therefore, to a temperature within those limits, it is certain that all future change due to the action of these living vegetable matters becomes impossible, so long as no new germs are introduced by the admission of air, or by admixture with wine which has not been similarly treated.

In aqueous liquids about 100° of heat are required to

destroy such germs, and sometimes even this is not sufficient, but, in the case of wines, the alcohol contained in them aids the action of the heat, and thus a lower temperature suffices.

M. Pasteur, who at first believed a temperature of 75° to be necessary, was able gradually to reduce it to 65° and 60°, and he thinks that it may be lowered even to 45°. This is a very important consideration, for it would be very easy to obtain from the sun's ray's falling on a closed chamber the last-mentioned heat, especially in the south of France, and thus avoid the cost and trouble of artificial heat.

M. Pasteur expresses his certain conviction that the air plays no part in the fermentations which produce changes in wine, acetic fermentation alone excepted; but his experiments show that the air acts upon wine deprived of all principles of fermentation, and that, with the aid of light, it takes away their colour, and communicates a flavour resembling that of Madeira.

Direct solar light has no influence on wine secured against the entrance of air.

The commission reports that it has examined with the most scrupulous attention the results recorded by M. Pasteur, and sanctions them with its entire approbation.

M. Marès, correspondent of the Academy of Sciences, has put in practice the system of M. Pasteur, for his wines of the Hérault, which are liable to alteration, and can only be kept by successive additions of alcohol; and he reports that when heated to 60° they keep perfectly.

The process of M. Pasteur then, says the report, will enable the wine-growers to make all their wines keeping wines, capable of travelling without danger, and of remaining many days open without becoming clouded or otherwise injured. The north and north-west of France may thus obtain wine cheaper yet more stable, and wines which heretofore were compelled to be consumed at home may be transported to the north. England, especially, receiving wine which will not require any particular care, for which long keeping will be unnecessary, and a bottle of which, after being uncorked, may be kept good in an ordinary apartment for a considerable time, will become an improving market. Everyone who has visited England has been impressed with the fact that the arrangements of the houses and the habits of life must be modified before the light wines of France, which require especial care, could come into general use; but the process of M. Pasteur, which renders such care useless, is of a nature to exercise the happiest influence in the extension of the trade with England.

Pure science, even in its more delicate forms and apparently useless discoveries, now imparts confidence and respect; but it may not be entirely without use to state, that this problem, the solution of which had been pronounced almost hopeless, has not been elucidated by any accident, M. Pasteur having proceeded from the outset by a chain of reasoning controlled by a series of experiments logically arranged, and rendered conclusive by their precision. The views by which he has thrown such light upon one of the most important economical questions, were first solidly established by him in the domain of theory.

It need scarcely be added that, after the reading and discussion of such a report, the prize medal was voted to M. Pasteur without a dissentient voice.

OPENING OF THE FIRST LYCÉE FOR SPECIAL EDUCATION IN FRANCE.

The Lycée of Mont de Marsan, as remodelled on the new plan of special education, has been opened by M. Duruy, the indefatigable Minister of Public Instruction, and the novelty and importance of the new system of public education make it desirable to give the principal passages of the Minister's speech at length. The objects in view have been little understood by the public, and rather sharply attacked by some critics, so that M. Duruy's own explanation of the new plan of special education deserves particular attention.

M. Duruy, after alluding to the doubts thrown on the project of converting the old Lycée of Mont de Marsan into a special college, and stating that the applications for admission were far more numerous than could be met, said:—

"Classic literature formed the French mind. In its moments of weakness it was still at that fruitful source that it could refresh itself; and, if we desire to maintain purity of language, correctness of form in design, and exquisite judgment in thought, we must remain faithful to the grand antique. But in our busy society, every one has not the power or the leisure to abandon himself for long to Plato and Horace. When religion, philosophy, and science spoke Latin; when Condé went to the Sorbonne and took his part in the Latin dissertations, and Madame de Sévigné read Tacitus in the original; when, finally, the most popular book produced during the latter part of the reign of Louis XIV. might have been taken for a production of Homer or of Virgil, then there was but one system of education, that of ancient literature, and those alone were considered in the state who could attain it. At the present time multitudes aim at intellectual existence because they cannot live by their hands alone. The products of agriculture and industry amount to hundreds of thousands in value, and, thanks to the machines which science has invented, the muscular arm of man is almost disregarded by industry, and agriculture is daily learning to do without it. Before coming here I visited a manufactory in which a portion of the furniture and fittings of your Lycée were made, and amongst 3,000 workmen I found only ten who had to exercise any muscular power; but what address, what intelligence has each to exert now-a-days! It is no longer the man who labours and suffers in the flesh, but matter broken in which is made to toil in his place. . . . . . How many have we to execute this intelligent labour? An immense army, to which our great schools have furnished admirable generals and learned captains, but in which those who head the soldiers, and when necessary replace the leaders, are too often wanting. Still at the present time, when liberty of commerce has left the lists open to all comers, it is our duty valiantly to defend the French market, and to dispute the markets of the world with the producers of the universe. One of the conditions of success will be not to remain behind the people who have already outstripped us in the intellectual development of the labouring classes. France has 4,000 classical pupils in her lycées and colleges, which ensure a large supply to the liberal professions, and 5,000,000 of children in primary schools, who seldom go beyond elementary acquirements, when they reach so far. Between the two classes there is an abyss which only a few, specially gifted, succeed in crossing. Over this abyss we must throw a bridge, and special education supplies us with the means."

The speaker then alluded to a complaint made by Louis XIV., that the University did not teach practical science, and quoted a speech of Leibnitz, that, "The manual occupations ought to be presided over by men of science, and the savants would then be the true preceptors of the human race."

"I do not hesitate to assert," continued M. Duruy, "that the greater portion of young men lose the time which they pass in the colleges, some from learning what is useless and sometimes hurtful to them, and others from not learning what it is essential for them to know. This is not nature's fault; she is more liberal than most people imagine—it is the fault of education if every man is not made serviceable. The principles of fertility are hidden in these wastes, which only required an able hand to bring forth abundant fruit. One of these wastes the revolution tried to produce, in planning a vast system of education which should extend to all the people 'the knowledge indispensable to artists and workmen of all classes.' The central school

did not succeed. Fourcroy and Cuvier hoped at least to preserve the principle, but under Fontanes the University took a contrary direction, and, in spite of the efforts made during the last fifty years by the most eminent men whom the Ministry of Public Instruction has had at its head, or in its councils, we are still following the route marked out by the old Universities. Shall we be more fortunate than our predecessors? The future will tell; but I may be allowed to say that my confidence is complete. Without faith nothing succeeds, and I possess faith in my work—this, then, is a first element of success. Let me add that I can count, for advice, on all the notabilities of the country—and for action on the whole University of France. With such auxiliaries it is not presumptuous to calculate on victory.

"You know the organisation of Special Instruction; but it is not out of place here to recall its principal characteristics:—

"Its object is the diffusion of fundamental and useful knowledge — moral and religious education, French language and literature, history and geography, arithmetic, accounts, and ordinary legislation—these form the foundation necessary for all the world. The sons of merchants, manufacturers, and agriculturists will add thereto, according to their requirements, the living languages, drawing, and the practical applications of mathematics, chemistry, physics, and natural history, which of itself forms the materials of all the common arts and the highest forms for the development of the plastic arts.

"The peculiar character of special instruction is its variety, in contradistinction to classical education, which is and should be uniform from one end of France to the other. All the Lycées are alike: all the special schools should differ, for in these the education should be determined by local necessities. I have even carried out this principle so far as to arrange elements of education in a programme extending over five years, so that a child compelled to stop at the end of the first, second, or third year shall still carry away with him something useful. As I have already said, it is a system of concentric circles, constantly increasing in diameter with the progress of the pupil, who will, however, always obtain first what he most requires. If he proceeds to the end it will be well; if he halts on the road he will at least not have lost all, like the scholar who quits the Latin Lycée when on the third or fourth form. Classic study is an arch which is only of use when the keystone is in place, and this can only be done in the upper classes of rhetoric and philosophy.

"The formula which best represents the idea of the new plan of studies will then be—to each according to his wants and to his capabilities.

"In order to assure this liberty of plan to the new instruction, and to secure for each locality the studies which it requires, a council of improvement is attached to each special school, and this council will be composed of the commercial and industrial notabilities of the town, presided over by right, not by a member of the University, but by the *maire*, the natural representative of every father of a family in the city. This council is invested with important attributes. It will choose from the general official programme the parts which it thinks fit; it will assist at the classes; take part in the examinations; have charge of the museums and collections; help those who are quitting the school to employment best suited to them; and report to the minister annually. Local influence will thus have free exercise; this is scholastic decentralization in the widest sense.

"From eight to eleven years the pupils will follow the primary courses; from twelve to sixteen, the special courses, terminating with a public examination before a departmental jury, which will grant diplomas that will be issued by the minister in the name of the Emperor, and which will, doubtless, find favour in industry as well as with the great administrations.

"If amongst the pupils of the special schools it happens that fortuitous circumstances and special aptitude lead some of them towards the study of the ancient languages, a series of lessons will prepare them for following, after the special examination, a course of Latin which in a year or two will lead them to one of the bachelorships, perhaps to both, and consequently to the great government schools, as well as to the liberal professions. In this case, the pupils will finish instead of commencing with classical studies, and they will proceed all the more rapidly from the fact that their minds have been prepared beforehand by studied and various cultivation. I am not here nursing vain illusions; the pupil who this year has gone out first from the Polytechnic school followed this very method, only it was not so decided and firm as it is now.

"The course adopted by you has already been followed by Mulhouse, Forbach, Sainte Marie aux Mines, Bruyères, Parthenay, Lectoure, Tournus, and Montélimart, and it will shortly be by Cognac, Clermont sur Oise, and twenty other towns where the change is in preparation, for this change is the only healthy course for the greater number of our 251 communal colleges.

"Do you know what those 251 colleges cost annually? More than eleven millions (£440,000); and they produce 253 *bacheliers-es-lettres!* . . . . .

"Instruction will thus be offered to all and every one, not forcing any one out of his place, but raising everyone within his own sphere; the field labourer and the artisan by the primary school; the manufacturer, merchant, and agriculturist by the special college; and the magistrate, the savant, and the man of letters by the classical Lycée and the superior school. . . . . A great capital, the most precious of all, is left dormant at present with a considerable part of our population, that which nevertheless forms our great reserve of force and intelligence, and you know that the constant thought of the Emperor is 'to fortify the body and elevate the soul of the nation.'"

The new Special College of Mont de Marsan opens with two hundred scholars, but as many more have been refused for want of accommodation. The Normal Special School of Cluny numbers already twenty-one pupils. It may be added, too, that in the department of the Loire, where special education was introduced before the present system was inaugurated, the diplomas are highly esteemed, and the pupils afterwards find good employment for their talents.

The Minister of Finance has just announced that candidates for situations in the post-office and in the offices of taxes and customs, holding special education diplomas, will henceforth have a certain number of marks or other advantages awarded them.

Fine Arts.

SCHOOLS OF ART: NEW MINUTES.—Information received from Bristol indicates that the effects anticipated by masters and local committees from the late new minutes have already set in. Those minutes empowered the holders of second grade certificates to teach night classes in Mechanics' Institutions and national schools, and thereby win rewards which had previously accrued only on instruction by art teachers possessed of the higher qualification known as "the master's certificate." It was objected a year ago, at the deputation to the Lord President of the Council, headed by Sir Stafford Northcote and including twenty members of Parliament and representatives from thirty-five schools, that to empower the holders of the second or elementary certificate to set on foot, under express Government reward, independent art classes would weaken the existing schools of art, diminish the income of the highly qualified masters, and authorize an art instruction of a quality below the standard of that hitherto maintained by the holders of the higher certificate. On the other hand, the Committee of Council on Education have a right to urge that, under this new provision, art education will be diffused all the

more widely and at a cheaper rate among the industrious classes, for whose benefit schools of art were mainly established. The qualification of the persons who are now coming into the field as teachers is indicated by a statement made by Mr. Walter Smith, master of the Leeds Schools; he says that, at a recent "examination of that school, no less than eleven pupils, mechanics, joiners, and school-boys, took the second grade certificate in Leeds, after a few months of casual study." The accounts from Bristol state that the benefits offered by the new minute to those who possess the certificate of the second grade are being taken advantage of by teachers in that neighbourhood, and a printed bill has been issued which announces that at a British School in that city, "drawing classes will be opened in connection with the Science and Art Department," in which the master, a holder of a second-class certificate, will instruct pupils in "free-hand, model and geometrical drawing," "perspective, mechanical, and architectural details, together with figure and landscape sketching if required." It is further announced that "a Government examination will be held in March, at which all students will be eligible to sit, and if successful will receive certificates of merit, prizes in books, colour boxes, instruments, &c." The Bristol School of Art, in common with other schools throughout the country, suffers from the opening of these night classes. Before the recent minutes, the committee of the Bristol School had made, in concert with the masters, considerable efforts, in the interest of national education, to extend art-instruction to schools for the poor. This part of their duty they are now compelled to suspend. Yet Bristol has, by public subscription, built a commodious school, and the expense of maintaining it is in part borne by annual subscriptions, of which the committee pay a large share. This state of things in the west is said to be an index to the situation, under the new minutes, of schools of art in other cities.

Course of Study at the Paris School of Fine Arts.—Since the reorganisation of this school, constant improvements have been made in the course of studies, and it will not be uninteresting to give the heads of the course just published for the session which commenced on the 3rd instant. There will be thirteen lectures a week; two of these are addressed especially to pupils in the class of painting, and two to those in the architectural class; the remainder apply to all the classes. The professors are eight in number. The mathematical chair is filled by M. Francœur, who will treat twice a week of conic sections, statics, the centre of gravity, machinery, plan drawing, and superficial and solid mensuration; M. Chevillard lectures on perspective, once a week for the painters, and once for architects; M. Ossian Bonnet treats twice a week on descriptive geometry; M. Baude also twice a week on practical construction, administration, and accounts; M. Pasteur, director of the scientific studies at the Ecole Normale, or his colleague, M. Cloez, will lecture once a week on geology, physics, and chemistry; Mr. Huguier will deliver two lectures a week on anatomy; M. Heuzey once a week on history and archæology; and M. Taine once a week on æsthetics and the history of art. Each of these gentlemen occupies a high position in science or literature, and some of them are amongst the most popular professors of the day. To complete this account it should be added that the studios of the school are directed by the painters Cabanel, Pils, and Gérôme; the sculptors Dumont, Jouffroy, and Guillaume; the architects Constant Dufaux, Paccard, and Lainé Charles; the engravers Henriquel Dupont, and Farachon; the greater portion of whom are members of the academy of the fine arts in the Institute of France.

Manufactures.

Deposition of Metals.—The following is the account given by Dr. Dullo, in the *Journal d'Industrie*, of the method adopted in Germany for covering iron objects with copper. The surfaces are cleaned with a brush and hydrochloric acid, and the objects are then left in water slightly acidified; they are afterwards placed in a bath composed of 25 grammes of oxyde of copper, 170 grammes of hydrochloric acid, a quarter of a litre of water, and half a litre of alcohol. A regular deposit of copper takes place on the surface of the iron, the rapidity depending upon the proportion of the alcohol, which is the active agent, to the other ingredients. The iron may be coated with the aid of pure alcohol only, but in this case the deposit is very thin, and in the form of chloride of copper, which is converted in the end into metallic copper. The chloride which adheres to the surface should be carefully brushed off after the operation, and the surface dried. If iron thus coated with copper is placed in a bath consisting of 10 grammes of chloride of iron and 1¼ litre of alcohol, in contact with metallic zinc, the surface is covered with a fine silvery deposit, which adheres firmly to the copper. Copper may also be covered with a layer of antimony by the following process:—Dissolve chloride of antimony in alcohol, and add hydrochloric acid until the mixture becomes clear, clean the copper well and leave it in the bath for three quarters of an hour. The effect of the alcohol in the preceding process is thus explained; it moderates the precipitation of one metal from its solution by another metal, and causes the precipitate to fall in an extremely divided state; when alcohol is used alone, without water, the coating of copper thrown down is reduced to the last degree of tenuity. It is recommended that when the work is finished it should be well washed, first in water, and afterwards several times successively with a solution of carbonate of soda, and with weak hydrochloric acid, and finally carefully dried in a warm place. The perfect silvering of vases, or plates of glass, is always a matter of some difficulty, and M. E. Reichardt recommends the following method:—Prepare four solutions—first, 10 grammes of nitrate of silver to 100 grammes of water; second, an aqueous solution of ammonia, of 0·984 density; third, 20 grammes of caustic soda and 500 grammes of water; and fourth, a solution of 25 grammes of sugar in 200 grammes of water, to which is added a cubic centimètre of nitric acid, at 36°, and let the whole boil for twenty minutes. When cold add 50 cubic centimètres of alcohol, and as much water as will make up the total quantity to 500 cubic centimètres; then take 12 parts of the first, 8 parts of the second, and 20 parts of the third solution, add 60 parts of water, and let the mixture stand for twenty-four hours; lastly, the solution No. 4 is added, when the whole becomes of a blackish tint, in consequence of the finely divided precipitate of silver which begins to fall. M. Reichardt has discovered that the deposition of the silver is greatly aided by motion, and that when the bath is continually shaken the deposit on the inner surface of glass vases is always satisfactory, and he recommends that in silvering plates of glass they shall be placed in evaporating dishes, or other vessels, so that the sides may give an oscillating motion to the liquor in the bath when shaken. In acting on large articles he recommends the glass plates, or other objects, to be fixed within tubs or vats, which may then be rolled or rotated pretty rapidly.

Commerce.

The Condition of the Tea Trade.—On this subject *The Produce Markets Review* says:—Of all the articles of produce imported from abroad, tea, estimated by the computed value of the imports, stands fifth in the list, whilst of those on which duty is paid it stands second. Taking the official returns for the year [illegible] as our ground of comparison, we find the computed value of the year's imports of cotton, corn, wool, sugar, tea, to

›e as follows:—Cotton, £66,032,198; corn, £20,724,115: vool, £14,930,430; sugar, £11,303,115; and tea, ;10,044,462. There can then be little doubt as to its ·alue and relative rank as compared with other articles ›f trade; and whatever amount of reflected credit ıttaches to reformers of trade customs in our most ıecessary articles of consumption, should belong in an special degree to those who wish to improve the condiion of the tea trade. In wealth, in their knowledge of rade, in the stability of their credit, the tea merchants nd tea brokers are inferior to none in commerce. On very ground, then, we are not unreasonable in expectng from those who have the management of the tea rade something more nearly approaching completeness han we are likely to find in smaller trades of less wealth nd advantages. But practically, the contrary is the ase, and the whole tea trade is in an utterly disorganized tate. Whether we consider the inconveniences arising rom the present barbarous system of "clearing," the lelays in the delivery of weight notes; the variations n the brokers' estimates of market value; the balloting or order of sales, the intervals between sales, the sepaation of sales of Chinese from sales of Indian teas; or he more serious evils of "coaching" and "buying over" —we shall find that there is hardly a single department n which reforms are not imperatively called for. The endency of most inconveniences is, by gradually inreasing in intensity, to promote their own eradication; nd when things comes to the worst, some simple and ummary method is generally extemporised which will give the relief sought for. It is surprising, however, ıow long-suffering people are when once habituated to a itate of things, even when it is acknowledged to be unsatisfactory. The system which permits sales to be ınnounced, bids to be made, and all the formalities egularly performed, when it is known that not a bid is o be expected unless an especial pledge to sell is given n print, and when that pledge is omitted, is surely farcical. The opinion entertained by the public of this node of procedure is sufficiently indicated by the fact hat they will assist only at those sales which are ınnounced as "without reserve." In this instance, as ndeed in all cases where there is any deviation from ight principles, the disingenuous attempts to influence narkets by announcements of sales never intended to be nade recoils on those who first led the way; and inending purchasers reserve their opinions and their noney for those lots which are put up with the *bonâ fide* ntention of being sold, in accordance with trade regulaions, to the highest bidder. The habit of sending amples daily to the wholesale houses with prices ar above market value marked upon them, or left for bids to be made with no price at all given as a guide by he brokers, appears equally unbusiness-like, and must ırise from an uncertainty in valuing, such as a system ›f *bonâ fide* public sales of all kinds of tea would at once ure, by establishing standard values for the day. By ıolding sales of China tea only once a fortnight, by the till greater absurdity of omitting the series for three veeks when five Tuesdays occur in a month, and ›pposing the sale of first-hand teas by auction, much nischief is done, as the insensible influences on value ›f regular daily transactions is lost, and the values of he better kinds is to be ascertained only by private ›ffers to the wholesale trade, and a quiet comparison ›f their bids, which serves no purpose but that of naking an apparent mystery of the art of selling tea which does not really exist. The number, variety, and ong continuance of the several inconveniences enumerated point to the existence of a radical defect—the want of some recognised authority to take cognizance of the whole subject, and to carry out such alterations and modifications as the spirit of the times and increasing trade may render desirable. Surely a system which was suited to a trade of 20,000,000 lbs., wants many alterations to adapt it to the present trade of 140,000,000 lbs.; and the longer reform is delayed, the greater will the confusion become. It is now more than thirty years since the first public sales of tea took place, and the enormous strides that have been made in every other branch of commerce should not be without some corresponding improvement in this department. The first step wanted is a voluntary resignation on the part of the leading brokers and merchants of that dictation which was suited only to a small trade, and which has been exercised of late years apparently simply for obstruction, with the object perhaps of attempting to maintain a monopoly which the increase of trade had endangered. The course of things has, however, rendered the old system impracticable; for instance, it is impossible that sales which were calculated to serve 1,000 packages should be equally effective for 50,000 packages. During the last ten years the quantity of tea retained for home consumption has increased year by year, without a single exceptional decline, from 63,000,000 in 1856 to 98,000,000 in 1865. A consideration of this circumstance alone would suggest the absolute necessity of adopting arrangements to meet the requirements of an augmented and still augmenting consumption.

Fisheries and Use of Fish in Norway.—The late exhibition of fishing implements, tackle, and accessories at Boulogne has drawn great attention to the admirable uses and methods connected with the fisheries and the application of fish in Norway. The number of items exhibited by Norwegians at Boulogne was as large as that of the French, namely, about a thousand, a fact not at all surprising when it is remembered that the people of the western slope of the Scandinavian Alps possess few forests and scarcely any arable land, and are forced to seek a large portion of their food in the seas which bathe their rocky coasts,—seas that are broken up by innumerable islands, and the shores of which are indented with bays of all sizes and shapes, so that the whole forms, as it were, a grand natural reservoir for the finny tribes. The ingenuity of the Norwegians has discovered a hundred ways of pleasing the palate of the home consumer, and increasing the export of articles derived from the sea. Preserved fish and portions of fish, such as roes and sounds, salmon and lobster patties, or rather pasties or *patés*—for the first word gives an idea of something small, whereas these and other *patés* well known on the Continent resemble in size the famous venison pasties of the olden time in England, and are often a yard or more in length—preserved mussels, lobsters, prawns, and a dozen other articles make up altogether a very considerable trade. Amongst the most peculiar preparations of Norway, however, are the fish flours, *farines de poisson*, as they are called; they are composed of the flesh of fish reduced to powder, with some additional substances, and the biscuits made from these flours are said by certain chemists to contain four times the nutritive matter of beef, and sixteen times that of milk or rye bread. The *farine de poisson* is also used in place of rice and potatoes; and the dishes prepared from it are served at Norwegian tables with the poultry, and are said to be very palatable. The refuse of the fish-curing establishments, and all the uneatable portions of the fish are employed in the manufacture of a manure called fish guano, and which sells at the rate of £5 or £5 10s. per ton. It is principally sent to North Germany. The Norwegian system of fishing resembles that of England; large well-boats are made use of for the taking of the fish, which is carried to market by smaller and swifter vessels; but the Norwegians have introduced into their system features unknown in ours. It was found that long confinement in fishing boats had a serious effect upon the health of the men, who could in such vessels obtain little real repose from their labours, and therefore the Norwegians invented the inn-boat, or floating *maison de santé*; these boats are divided into large private cabins, well ventilated, and comfortably fitted up, and have all the arrangements for cooking on a large scale. The fishermen, when over-

fatigued or ailing, are transferred to inn-boats, and are thus able to escape many attacks of illness, and to recruit their strength. Amongst the novelties recently introduced or invented, is a van for the transport of live fish; the body is composed of tinned iron, and the water is kept in a state of freshness by means of a current of air, kept up by mechanical arrangements. It does not, however, appear that this mode of conveyance has yet been introduced into actual practice.

MINERALS IN SPAIN.—A discovery of a bed of natural phosphate of lime, near Merida, in the centre of the Estremadura, has been made by M. de Luna, who in 1865 was intrusted with the surveys for the line that is to unite Madrid and Lisbon, by crossing the western part of Spain, and passing by Talavera de la Reina, Merida, and Badajoz. This bed is of a mountainous form, and very abundant and easy to be worked in open cutting. An English and Portuguese company have made use of it for agriculture, and this valuable material is transported at a great expense across Portugal. In Spain they do not even think of making use of it, and in Portugal it is scarcely used. In the western part of Spain there are lead and silver mines in the whole of the provinces of Murcia and of Carthagena; immense deposits of sulphur in the provinces of Lorca and of Almeria; nitrate of potash everywhere, only requiring to be washed from the earth; deposits of manganese and iron at Cabo de Gato. Copper mines of immense wealth, abandoned since the time of the Romans, are situated in the province and near the town of Granada. The famous mines of sulphate of copper in the province of Huelva, are worked by the English and French. Mountains of natural sulphate of soda exist in the environs of Toledo. The Estremadura is rich in lead, silver, copper, and, above all, in natural phosphate of lime. Lead and tin, and even zinc, are found to the north-west, in the province of Santander. To these may be added a fertile soil, an Italian sky, the date palm, that produces an excellent fruit, in the province of Alicante, and in Elchi a quantity of palm trees, that even the Algerian provinces do not possess; a great part of the soil arranged by the Moors for irrigation, and all these advantages should make Spain a country as powerful and prosperous as it is poor and degenerate. To return to the discovery of M. de Luna, the natural phosphate of lime, the samples of which he forwarded to the Academy of France, contain 60 per cent. of tribasic phosphate of lime. It, therefore, would be easy to manufacture from it the acid phosphate of lime, at a low price, by means of the sulphurous acid of Almaden.

Colonies.

FARMING IN NEW SOUTH WALES.—There have been heavy rains throughout the country, more particularly in the central districts and New England, and the squatters have better prospects than they have had for some time, stock are rapidly bettering their condition, and there is a good supply of fat cattle in the markets. The lambing is expected to be excellent. At a comparatively small expense water has, in most cases, been procured in the neighbourhood of Lachlan, at a depth of between 100 and 200 feet, and the supply is very large; one well is said to be capable of watering no less than 10,000 sheep daily. This is enough to show that the productiveness of sheep farms might be increased were the runs fenced. The roads in many districts are very bad, and in some places almost impassable, and, should the rains continue, it will be difficult for the squatters to send their produce to market. According to a report published by the Government Scab Inspector, this disease is nearly extinct. The total number of sheep infected during the late outbreak was 350,000, of which about 300,000 were destroyed. The "Free Ration System" has been for some years past one of the squatter's greatest grievances, and one with which it has been found very difficult to deal. Every idle loafer roving about the country seems to imagine that he has a prescriptive right to demand food and lodging at the squatter's expense; and on some stations through which there is a large traffic three or four of these vagabonds quarter themselves nightly upon the unfortunate grazier. They never work if they can help it, but walk about from place to place, feeding at the expense of all the squatters who will accommodate them, and food and shelter are very rarely refused in the bush. This system is so great a tax that on some stations the cost of the free rations given to travellers amounts to about £800 per year.

NEW SOUTH WALES SUGAR.—The culture of sugar is exciting some little attention in this colony, particularly among the farmers on the Hastings, the soil of which locality is said to be admirably adapted for sugar-cane. There are now about fifty acres of cane growing on the Hastings River, and it is said that the cane, when crushed and manufactured, will yield a nett profit to the growers of about £80 per acre. Mr. E. Holland, of Port Macquarie, is understood to be preparing a parcel of sugar for the Paris Exhibition, which it is anticipated will place the capabilities of the colony as a sugar-growing country in a favourable light.

THE WHITE ANT.—The Rev. Z. Barry, of St. Jude's, Randwick, states that the only timber that can effectually resist the white ant is the Jarrah, or Western Australian mahogany. "This," he says, "is never eaten by anything, and never decays in the ground." Sooner or later it seems likely to be used in many localities for posts and rails, for railway sleepers, for wharves, and for the ground floors of houses.

QUEENSLAND STATISTICS.—The following is a return issued by Government of the lands leased, granted, and sold during 1865:—Sold by public auction, 36,05[illegible] acres, privately, 102,796 acres; under agricultural reserves, 6,944 acres; total, 145,798 acres. There were leased during the year 7,578 acres, and granted for special purposes 933 acres. As compared with the returns of 1864, the sales of land in 1865 show an increase of 5,985 acres. The proceeds of the land sold in 1864 were £210,725, and in 1865, £224,403, showing an increase of £13,677 in favour of the latter. The total quantity of land sold before and since the establishment of the colony, 580,034 acres. The estimated value of imports and exports for the year 1865 are as follows:—Imports, £2,505,559; exports, £1,153,464; total trade, £3,659,023. As compared with the trade of 1864, the imports of 1865 show an increase of £337,605, and the exports show a decrease of 93,500. This decrease is owing to the comparatively small quantity of wool shipped. Wool is the only article of Queensland produce that does not show an increase in the Customs' returns for 1865, as will be seen by the following table of the quantities of colonial produce exported in 1864 and 1865:—

	1864.		1865.
Cotton	38,730 lbs.	..	145,820 lbs.
Gold dust	22,037 oz.	..	26,[illegible] oz.
Hides	82,457	..	45,611
Arrowroot ..	6,343 lbs.	..	12,141 lbs.
Copper ore ..	29 cwts.	..	4,424 cwts.
Wool........	14,006,789 lbs.	..	12,251,841 lbs.
Tallow......	1,137 tons	..	1,940 tons.

The following is a return of the stock of animals at the end of December, 1865:—Horses, 51,091; horned cattle, 887,856; sheep, 6,810,005, and 14,888 pigs, showing a total increase for the year of 1,146,671. The total quantity of land under cultivation on December 31st was 14,414 acres, showing an increase of 2,401 acres over last year's return. On 31st December, 1864, the population of the colony was as follows:—45,516 males and 28,520 females, and had increased in 1865 to 53,[illegible] males and 34,478 females. In 1865 there were 31 Government schools; the average attendance of pupils was, daily, 2,981; the total expenditure for same being, exclusive of cost of building, £659,899.

Notes.

[A]PPARATUS FOR SAVING LIFE.—The inundations that [hav]e recently taken place in France have shown how [ver]y necessary it is to establish a communication, by [som]e simple means, between two points rendered in[acc]essible by the water. M. Gustave Delvigne has [inv]ented an arrow to carry a line that may be easily [use]d to render assistance in such circumstances. There [are] everywhere a great number of guns available, either [mu]skets of the soldiers, carbines of the gendarmerie, or [fow]ling pieces. The average calibre is from 17½ centi[me]tres to 18 centimetres. This arrow, for the purpose [of c]arrying a line, consists of a rod of wood 1·10 to 1·20 [me]tre in length, and 14 to 15 milimetres in diameter, of [as]h, or any other flexible and straight grained wood. [At] the end which rests on the charge a copper ferule is [fix]ed with a small pin, 15 to 20 millimetres in height, [an]d half a millimetre less in diameter than the calibre [of] the gun. This ferule thus forms a projection, a [sto]p at the back of the arrow. In urgent cases [th]is stop might even be made by a little pin [dr]iven through the wood. An arrow thus prepared [w]ould weigh 180 to 200 grammes. For a fowling [pi]ece, the barrel of which is shorter, the weight of the [ar]row is reduced by a third, and also the charge of [po]wder. At the front of the arrow is placed a loop, [fo]rmed by the end of a line of about 60 centimetres in [len]gth, firmly fastened by means of splice or a liga[tu]re. At the middle of this doubled line two strong [li]gatures are made with fine twine, so as to form [a] ring clasping the rod tightly. In this manner [th]e doubled line forms two loops of equal lengths on [ea]ch side of the ring. Below and against this fastening [a] noose is formed with the end of a line of the same [si]ze, with five or six turns tight round the rod. Finally [t]he line to be carried is fastened to the loops. This [li]ne, 100 metres in length, and from 2½ to 3 milli[m]etres in diameter, is wound on a conical mandril, which [i]s taken out when the ball of line is completed, and [t]he end within the ball is that which always should be [a]ttached to the arrow. If necessary the balls of twine [s]old by the rope makers, and which are easily unwound [f]rom the interior, may be used. This done, the gun or [m]usket is then loaded with a charge of from 2 to 2½ [g]rammes of powder (about half an ordinary charge), [t]hen two good wads of felt are rammed in, or else a [s]trong paper wad. The arrow is then put in (the [w]ood of which should be first slightly greased), and [i]s well pressed down to the wad. The gun is pointed [a]t an elevation of 25 to 30 degrees in the direction [r]equired to send the line. In the firing the fastening [a]nd the noose slide stiffly the whole length of the arrow [a]s far as the projection or stop on the ferule. By this [m]eans the inertia of the line to be carried is gradually [c]hecked, and the shock that would be liable to break the [l]ine is prevented.

PRESERVATION OF BUTTER IN FRANCE.—One part of [s]ugar, one part of nitre, and two parts of salt reduced to a [v]ery fine powder constitute a good mixture for the preser[v]ation of butter. Sixty grammes, or rather more than 2 oz. of [t]his mixture, is sufficient for a kilogramme, or about 2¼lbs. [o]f fresh butter, which, thus prepared, remains very good [a] fortnight afterwards; its taste is very soft and agree[a]ble, and it will last for years. There is also another mode of preserving, viz., the butter is melted and purified with honey, 60 grammes of which is used for each kilogramme, the two substances being mixed with care. An agreeable flavour is obtained, and it will remain good a long time.

THEATRES IN EUROPE.—The total number of theatres in Europe is 1,581. Of this number there are 150 in Great Britain; 337 in France; 346 in Italy, comprising Venetia; 168 in Spain; 150 in Austria; 191 in Germany; 44 in Russia and Poland: 34 in Belgium; 23 in Holland; 20 in Switzerland; 18 in Sweden and Norway; 15 in Denmark; 16 in Portugal; 4 in Turkey; 4 in Greece; 3 in Roumania; and 1 in Servia.

POPULATION OF NORWAY.—The following are the principal results of a census that was made the end of last year in the kingdom of Norway. The total population of Norway amounted, to 31st December, 1865, to 1,701,478 persons; and this shows an increase of 211,431 persons during the last ten years. This increase would have been greater had it not been for the emigration which has during the same period taken off 40,000 inhabitants. The population of the towns, amounting to 211,515 persons in 1855, has increased to 286,149 in 1865, showing thus an augmentation of 74,634, or 35·3 per cent. In the country the increase during the same period has only been 10·7 per cent. The cold and damp climate of Norway, but little favourable to agriculture, explains this difference in the increase of the population of the towns, where, thanks to trade and manufacture, subsistence is easier than in the country. Finally, the census states that in Norway there are 3,294,087 head of cattle, or 6,187 more than in 1855.

ARCHIVES OF VENICE.—Public attention has been turned lately, and not without reason, to the archives of Venice. An idea may be formed of their importance when it is stated that they are the records of 2,276 public offices, administrations, brotherhoods, convents, and other corporations both lay and ecclesiastical. They occupy not less than 278 rooms, in the ancient Franciscan convent, known by the name of Frari. The Abbe Cadorin, who has prepared a catalogue of them, estimates that there are twelve millions of files of papers there; and this figure will not seem incredible if it be mentioned that the shelves on which these documents are piled up in double row are more than 4,525 metres in length. Besides this enormous collection, the library of St. Mark, the nucleus of which is composed of the books bequeathed by Petrarch to the patron saint of Venice, contains a great number of political papers, and the Correr, or municipal museum, boasts of possessing documents that have for a long time disappeared from the official archives. It is not only the records connected with Venetian and Italian history that render these archives so precious. They contain numerous documents relating to the history of European nations and of celebrated men from the 13th to the 19th century. They abound, above all, in secret correspondence, extremely interesting.

Correspondence.

ADULTERATION.—SIR,—In the *Society of Arts Journal* last week you call attention to the fact that at our recent meetings in this town the Pharmaceutical Society exhibited various articles of commerce sold with a considerable adulteration. If I had seen this exhibition, one of the articles in which I am a good deal interested would have received an explanation from me which I propose to ask you to insert in your *Journal*. The article to which I allude is cavendish tobacco, which is mentioned as being largely adulterated with liquorice. A brother of mine in Natal, with whom I am associated in business, is a large tobacco grower in addition to his other growths of cotton and coffee. He finds a ready sale for tobacco manufactured in the shape of cake or plug cavendish in the colony, selling it there at about 1s. per lb. wholesale. But in its manufacture he had to use about ten per cent. of Spanish liquorice, and for this he had to pay 2s. 3d. per lb., entailing a very considerable addition to the expense of manufacture, instead of reducing the price as your notice would suggest. If he had imported this manufactured article it would all have paid the 5s. duty which is imposed by the customs on cigars and all tobacco, except the dried leaf, which pays 3s. 2¼d. per lb., the duty of course being paid on the

gross weight of the cavendish, and it is thus rendered a legitimately prepared, duty paid, commercial import. The fact of sailors having it for their own consumption shows that the cavendish thus prepared is liked better than a purer article, inasmuch as in the colony of Natal we willingly sell the tobacco at 9d. per lb. unmanufactured, while the cavendish would not be sold probably at much less than 2s. per lb. in retail quantities. I may just add that I have been sending out, through Messrs. Travers and Sons, "Baracco" juice, which will not be landed in Natal at less than 11d. per lb., to use with the leaf that we should gladly sell at 9d., or less.—I am, &c., J. Manning.

A Remedy Proposed for the Smoke Nuisance.—Sir,—Whilst looking at some gas works, many years since, at Birmingham, viz., in 1836, I was astonished at finding the thickened coal gas become diaphanous, and entirely purified of its pyrites and other dense colours, by being made to pass through a thin stratum of dried lime, which was laid upon a wire sieve; and I am tolerably certain that the smoke-gas was only passed once through the sieve in order to effect its purification, when it became fit for combustion. This being the case, the question now arises whether the coal smoke of every chimney cannot be purified in a similar manner, viz., by making the smoke pass, along with the draught of air of the furnace or fire-place, through a thin stratum of dry lime laid upon a sieve placed in the chimney of the same, such sieve to be removed temporarily as occasion might require. Should this remedy be found effectual, the grand difficulty of the present day—the smoke nuisance—will have been overcome, and at what a trivial cost for so great a benefit, for it would confer upon this vast metropolis—on all the world, in fact—a pure atmosphere and an unimpeded view of the azure vault of Heaven, and light and life and health to its myriads of occupants, and no longer to call for the, as yet, applicable but beautiful lines of Thomson:—

> "Ye who would from London smoke and turmoil fly,
> To seek a purer air and brighter sky."

Or otherwise, would it not suffice to pass the smoke through a simple sieve alone? although it is probable the deposit in the latter case would be much greater than in the former, because the lime would, especially when heated, destroy or absorb a great quantity, if not all, of the deposit, and render the volume of smoke as pure as purified gas, as it passes through the interstices of the sieve. Should the collection of soot upon the retina or surface of the sieve become considerable, yet, as it would be found chiefly on the under side, it would perhaps suffice in this case to shake or strike the sieve, so as to cause the deposit to fall down at intervals into the fire or furnace beneath, where it would be consumed along with the fresh coal. All the soot which at present adheres to the sides of the chimney, or passes out at the top, to infect the vital atmosphere, would be thus intercepted, and made to return to the grate by an occasional rotatory movement of the sieve upon its axle of support, or be removed by some other means when required.—I am, &c., J. S. Burt, F.R.S.
Wilton-place, N.W., Oct. 20, 1866.

MEETINGS FOR THE ENSUING WEEK.

Mon ...R. Geographical, 8½. Sir Henry C. Rawlinson, M.P., "On Mr. W. H. Johnson's recent journey to Khotan, in Chinese Tartary."

Tues ...Civil Engineers, 8. 1. Mr. W. B. Clegram, "Results of the employment of steam power in towing vessels on the Gloucester and Berkeley canal." 2. Mr. Samuel Healey, "On the employment of steam power on the Grand Canal, Ireland."

Wed ...Microscopical, 8.

Thurs...Linnæan, 8. 1. Col. Munro, "On *Bambuseæ*." 2. Rev. M. J. Berkeley, "On some Mexican Fungi." 3. Mr. T. Edward, "On the habits of some of the smaller Crustaceans."
Chemical, 8. 1. Dr. Daubeny, "On Ozone." 2. Mr. W. N. Hartley, "On a chloro-sulphide of carbon."
Syro-Egyptian, 7½. Dr. Samuel Birch, "On the Bilingual Tablet of Tanis."

Patents.

From Commissioners of Patents' Journal, November 2nd.

Grants of Provisional Protection.

Agricultural produce, stacking—2505—M. Ridley, W. Pawson, and C. Basker.
Alcoholic spirits, distilling—2681—J. Slessor.
Bales, fastening—2535—M. P. Robertson.
Baths, heating—2618—L. Wilson.
Boots, cutting out—2600—W. E. Gedge.
Breech-loading fire-arms, and cartridges for—2606—M. A. F. Mennons.
Breech-loading fire-arms, and cartridges for—2711—T. Restell.
Breech-loading fire-arms, cartridges for—2653—E. M. Boxer.
Brushes, rotating—2661—S. Holness.
Carriage wheels—2655—S. Collins.
Caustic soda—2691—A. R. F. N. Darbel.
Central fire percussion cartridges—2589—W. Clark.
Chloride of manganese, utilization of—2066—W. Clark.
Colouring matters—2669—G. T. Bousfield.
Cotton warps, sizing—2659—G. Lake, jun.
Fibrous materials, spinning—2596—J. W. Baker.
Fibrous substances, cleaning—2649—L. R. Bodmer.
Fibrous substances, spinning—2529—W. Redman.
Filtering presses—2602—E. T. Hughes.
Fire-arms, breech-loading—2622—J. Syme.
Fire escapes—2507—W. Ryan and W. Egar.
Fluids, propelling—2598—H. Forbes.
Forks, steels, and knife sharpeners—2663—E. Stevens.
Friction clutches—2197—C. McFarland.
Fuel—2683—J. Hamilton.
Furnaces—2667—J. Griffiths and J. Beard.
Hackle pins, flattening—2604—C. Perry.
Hammers—2677—J. G. Tongue.
Hansom safety cabs—2701—F. Ockerby.
India-rubber—2707—E. L. Simpson.
Iron and steel—2614—G. H. Benson and W. G. Valentin.
Iron and steel—2616—G. H. Benson and W. G. Valentin.
Kitchen ranges—2121—E. Stevens.
Lees—2671—A. Swan.
Medallions, producing reduced copies of—2609—C. J. Hill.
Packing pistons and stuffing boxes—2699—J. Hosken.
Parkesine—2709—A. Parkes.
Plastic work, pressing—2195—J. F. M. Pollock.
Portable baths—2635—H. Jones.
Reaping and mowing machines—2689—W. Manwaring.
Scouring stones—2464—J. Duckett.
Sewage, utilizing—2606—G. W. Shinner.
Sewing machines—1880—W. Clark.
Sewing machines—2610—G. F. Bradbury.
Shafts and axles, bearings for—2697—W. and W. T. Eades.
Ships—2608—W. Dudgeon.
Ships—2657—W. L. Wrey.
Steam boilers—2673—A. V. Newton.
Steel, casting—2612—G. H. Benson and W. G. Valentin.
Substances, distilling—2685—A. V. Newton.
Threads, &c., treating—2624—W. Pidding.
Translucent surfaces—2665—P. H. Newman.
Trestles—2651—T. Greenwood.
Weaving, looms for—2620—J. Bullough.

Inventions with Complete Specifications Filed.

Boots and shoes—2811—L. Daggett.
Galvanized iron—2810—G. T. Bousfield.
Gases—2759—G. T. Bousfield.

From Commissioners of Patents' Journal, November 6th.

Patents Sealed.

1233. C. E. Brooman.	1312. F. Wise.
1291. H. K. York.	1314. G. Snowball.
1305. C. Moseley.	1316. W. McHuraith.
1313. J. Becker.	1322. J. H. Ritchie, jun.
1320. J. L. Norton and A. Giles.	1329. J. Sheldon.
1334. D. C. Dallas.	1330. S. Middleton.
1340. R. Holliday.	1346. J. Bernard.
1345. W. Botwood.	1350. W. Prosser.
1358. B. Nicoll.	1351. W. Austin.
1362. W., J., and H. Harrison.	1376. J. H. Johnson.
1367. C. Pryse and R. Redman.	1395. W. Clark.
1402. J. Beale.	1431. J. M. Dunlop.
1427. J. Tombs.	1450. J. Longbottom and J. Eastwood.
1574. W. E. Newton.	1464. J. Purdey.
1674. A. V. Newton.	1526. W. E. Newton.
2230. J. Davis.	1755. C. D. Abel.
2242. W. E. Newton.	1737. S. Holmes.
1299. E. Fidler.	1844. T. W. Rammell.
1308. W. Ireland.	2223. T. Whitby.
1310. W. E. Gedge.	

Patents on which the Stamp Duty of £50 has been Paid.

2695. J. Brigham & R. Bickerton.	2717. R. Eaton.
2680. F. N. Gisborne.	2718. S. Bateman.
2681. J. Nash.	2720. J. J. Révy.
2690. B. Russ.	2744. H. Bessemer.
2722. J. Livesey and J. Edwards.	2746. H. Bessemer.
2749. F. E. Sickels.	2792. E. C. Nicholson.
2945. J. Smith.	2814. J., J., and J. Booth.
3131. E. Solvay.	

Journal of the Society of Arts.

FRIDAY, NOVEMBER 16, 1866.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Thirteenth Session of the Society will commence on Wednesday, the 21st instant, when the Opening Address will be delivered by Sir Thomas Phillips, Q.C., F.G.S., Chairman of the Council, and the medals awarded by the Council at the close of last session will be presented.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock :—

1866. November	—	—	21	28		
„ December	5	12	19	—		
1867. January	—	—	16	23	30	
„ February	6	13	20	27		
„ March	6	13	20	27		
„ April	3	10	—	24		
„ May	1	8	15	22	29	
„ June	—	—	—	26*		

For the Meetings previous to Christmas, the following arrangements have been made :—

November 21.—Opening Address by the Chairman of the Council.

November 28.—"On the Effect of Limited Liability Partnership on the Progress of Arts, Manufactures, and Commerce." By William Hawes, Esq., F.G.S.

December 5.—"On the Trade in Foreign Cattle." By John Irwin, Esq.

December 12.—"On Old London: its Streets and Thoroughfares." By J. G. Chace, Esq.

December 19.—"On the Study of Indian Architecture." By James Fergusson, Esq., F.R.S.

A book of blank Tickets of Admission to the Meetings has been forwarded to each Member, who is privileged to introduce two friends to each meeting on their presenting orders signed by him. Additional tickets will be forwarded on application.

The Cantor Lectures for the ensuing Session will consist of Three Courses, the particulars of which will be announced in the *Journal*.

A new list of members of the Society has been printed, and any member can have a copy sent to him on application to the Secretary.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had, *gratis* on application to the Secretary of the Society of Arts.

* The Annual General Meeting: the chair will be taken at four o'clock. No visitors are admitted to this meeting.

Food Committee.

The Council have passed the following resolution :—

"That a Committee be appointed to inquire and report respecting the food of the people, especially, but not exclusively, the working classes of the people; and that, having regard to the publications of the Privy Council and other documents, which illustrate the defective amount of nutritious food available for the population at large, the said Committee do report respecting the resources which are, or might be rendered, available for the production, importation, and preservation of substances suitable for food, and for improving the methods of cooking in use among the working classes."

Proceedings of Institutions.

Bodmin Literary Institution.—The general annual meeting was held on Tuesday, August 7th, H. Mudge, Esq., Vice-President, in the chair. The institution was found to be in a flourishing condition, there being 100 members enrolled—an increase of 18 since the last annual meeting. The treasurer's account showed a balance in hand, after paying the Midsummer bills, of £10. The news-rooms had been well attended during the year. The library contains about 1,700 volumes, including an assortment of books, maps, papers, &c., relating to the topography of Cornwall, and the number of volumes (1,152) taken out during the past year had been greater than in any previous year, and about 100 volumes had been added.

VINE CULTURE.

The following is an abstract of a report addressed to his Excellency the Minister of Agriculture, Commerce, and Public Works, by Dr. J. Guyot, on the comparative cultivation of the vine in the departments of Cher, Allier, Nievre, Saône and Loire, Cote d'Or, Yonne, Aube, and Loiret.

Each of these departments has afforded subjects for observation and important study; the department Cote d'Or, and the Gironde, which produce the most esteemed of French best wines, and Saône et Loire and the Beaujolais the best *vins ordinaires*, would alone have furnished the elements of a larger and more complete report. Assisted and encouraged everywhere by the wine-growing population, Dr. Guyot has been enabled to inspect 56 wine growing districts, and there still remain one-and-twenty to be inspected.

At Pouilly (Nievre) the white grape is principally cultivated. The principal vines are the green, grey, and yellow chasselas, and the white grape.

Since the establishment of railways, the grapes are bought on the spot by the Paris merchants, gathered, packed at their own expense, and paid for at 15 to 20 centimes per kil., taking all, the proprietors only having to weigh them. In this manner a considerable quantity of grapes are sold. The remainder serve to make the light wines, the principal production of the district now as formerly. These white wines have body, are full of spirit, and of good flavour. They keep for many years.

Nothing is more favourable to the advancement and to the welfare of the rural families than the equal division of the produce of the land between the proprietor and the labourer.

The wines of the chief growths of the Côte d'Or, and the produce of a good year, unite all the qualities of perfect wines; they do not require any mixing or any preparation in order to attain the highest degree of perfection. Each growth has its own particular bouquet and flavour, and this often does not develope till the end of three or four years.

The mixing with other wines completely alters them whatsoever be their qualities, and even when mixed among themselves, for instance, the mixture of two Burgundy first class wines, is followed by the loss of the distinctive bouquet, and a deterioration of quality.

The red wines of the Côte d'Or are of a good colour, much perfume, and delicious flavour; they are at the same time strong bodied, fine, delicate and spirituous, without being heady. Drunk in moderation they act as a tonic, and facilitate digestion. It may be added that they give strength to the body, warmth to the heart, and vivacity of spirit in the highest degree. It is on these three points that the best Burgundy wines surpass those of Medoc, distinguished above all by their digestive and hygienic qualities.

The special quality of the grape is important in the manufacture of the best wines of the Côte d'Or; the black or dark coloured grape for the red wines, and the white grape for the white wines.

In the eight departments that have been inspected, the vine occupies above 207,000 hectares, or nearly 515,500 acres, on a total area of 5,628,000 hectares, that is to say, a twenty-seventh part of this area.

The gross product of the vine culture is 177,000,000 francs (£7,080,000) on the gross products of the total area of these eight departments. This product supports 177,000 families, averaging four persons in each, or 708,000 souls, more than a fifth and nearly a fourth of the total population of 3,038,000 inhabitants of the eight departments.

An average family of four persons is amply provided for with 15 hectolitres of wheat, barley, rye, or maize in the year; three-quarters of a hectare, producing at the rate of 20 hectolitres per hectare, would be sufficient for this purpose. Thus for the 9,500,000 families that form the total population of France, the cultivation of 120,000 hectares of cereals for bread would amply suffice; and at the present time there are 10,000,000 hectares of wheat, rye, barley, and maize cultivated yearly.

To provide for the consumption of table wine for France alone about 4,700,000 hectares of vines would be necessary, or about 2,000,500 hectares more than there is at present cultivated for this purpose in France.

Thus the cultivation of grain for bread occupies 2,874,000 hectares more than is necessary, and the vines 2,500,000 hectares less than are required for home consumption. This shows the necessity for a great increase in the cultivation of the vine in France.

Fine Arts.

Lille Exhibition.—The Society of the Friends of Art of Lille has just issued its report on the Exhibition lately held there. The Exhibition was open from the 20th of July to the 20th of September, and the number of visitors amounted to more than 65,000, three-fourths of whom were admitted without charge. The Emperor and the Administration of the Beaux Arts of Paris patronized and aided the Exhibition, and the authorities of the town of Lille took upon themselves not only the cost of construction of the galleries, but also of the transmission of works of art, surveillance of the Exhibition, and incidental expenses. The sales of works of art amounted to more than £10,600, eight pictures being purchased for the museum of the town at a cost of 31,000 francs; more than a hundred by the Society of the Friends of Art, for 52,700 francs; and 225 pictures and other objects of art by private individuals at an outlay of 182,300 francs. The names of several artists well known in Paris appear in the list of purchasers, as, for instance, Anker, Breton, Brandon, Blin, Carpeaux, Daubigny, Duran, Antigna, J. L. Brown, the Etching Society of Paris, Diaz, Fichel, Ph. Rousseau and Zeim; and the works are of all classes, historic, poetic, genre, landscape, animals and sculpture, showing how valuable these local exhibitions are to artists, and how they cultivate the taste of the inhabitants of the provinces. The effect of local exhibitions on the taste of the populations in the midst of which they are held is remarkably evident; when an exhibition takes place in a town for the first time, except there happen to be some few connoisseurs in the neighbourhood, the pictures of the lowest class have the best chance, and just in proportion to the frequency and importance of subsequent exhibitions do the purchases rise not only in amount but in importance. The love of the beautiful is innate, and only requires, like other feelings and capacities, fitting opportunity and encouragement. When once good exhibitions have been held in a town it is extremely unusual to find them discontinued, and they are rarely interrupted, except by some great calamity or political excitement.

Manufactures.

Polytechnic Association of Paris.—This Association, which was founded in 1830, has for its object the gratuitous instruction of working men in scientific and industrial subjects. The meetings and lectures take place, of course, in the evening. It has fifteen sections, as they are called, established in Paris alone, one at the Ecole Centrale des Arts et Manufactures, one at the Ecole Turgot, others at the Ecole Jean Lantier, and the Ecole de Médecine; the others are in the most populous neighbourhoods, such as the quarter of St. Antoine, Montmartre, Belleville, La Villette, Vaugirard, the Batignolles, and other great industrial quarters. A new section was opened the other day at a commercial school at Passy, under the presidency of the Maire of the arrondissement. Baron Bonnemains and M. Meau de Saint Mesmin (the Secretary-General of the Association) addressed the Assembly, and the latter concluded his speech with the following sentence:—"There is a flame which burns and a flame that illuminates; the words which fall from the lips of our professors are the words of peace, of concord, and of truth." M. Simonin, mining engineer, then delivered a lecture on "Gold and Silver," showing their influence from economical, political, and social points of view, and relating his own experiences in California, where he had made a long voyage of exploration. In the intervals, as is usual at the special meetings of the Association, the singing class, which forms a part of the establishment, executed several choruses with great precision. The Polytechnic Association is one of the most popular institutions in Paris, and several of the most noted professors give their aid in the form of lectures and instruction.

The Manufacture of Sea Salt in Sardinia.—Sea salt is prepared at two places, in the island of Cagliari and at Carloforte. It is in the neighbourhood of the former town that the greatest quantity of salt is produced. This year the quantity manufactured at these two places will amount to about 20,000 tons. The establishment at Cagliari, worked by a French company under the direction of a practical man, occupies an area of 967 hectares, with a necessary number of evaporating basins for such an extensive operation. The company supplies the salt to the Italian Government at 4·50 fr. per ton. It likewise exports a considerable quantity to the ports in the Baltic. American ships, of large tonnage, take a large quantity to complete their home cargoes. The freight to the main land is 9·50 fr. per ton. The richness and abundance of the sea salt in the French ports would enable works to be established with success in the neighbourhood for the manufacture of chemical productions.

An Artificial Ivory (says the *Builder*) is now made in France from a paste of papier maché and gelatine, to which the name of Parisian marble is given. Among many other things, the finest and most compli-

cated mouldings for ceilings can be made, or capitals of columns can be constructed in any colour. It is said to be hard, durable, and elastic.

Commerce.

COFFEE AND CHICORY.—The *Colombo Observer* says:—It would seem that the influence of chicory on the consumption of coffee in Great Britain is greater than we could imagine, and is telling with increased effect. According to the best figures within our reach, the proportions for the three past years have been as follows:—

Years.	Coffee.	Chicory.	Percentage of Chicory to Coffee.
	lbs.	lbs.	
1863	32,666,666	10,500,000	32·14
1864	31,333,333	11,000,000	35·1
1865	32,750,000	13,000,000	39·69

It thus appears that while the consumption of coffee in Britain has been almost stationary at about 32,000,000 lbs. for the past three years, that of chicory has increased until the consumption of this article bears the proportion to coffee of nearly 40 per cent. And this, notwithstanding the fact that chicory is now liable to a duty of 26s. 6d. per cwt., and that mixtures of coffee and chicory must be so labelled. The conclusion is irresistible, that the people of England generally like to drink their coffee with at least one-third of chicory mixed with it. For this there is no remedy any more than for the preference which the English give to tea. But now that peace is restored to the continent of Europe, we may rely on a remunerative and expansive market for all the coffee Ceylon can produce.

INDUSTRIAL CO-OPERATION IN GERMANY.—A report presented recently by M. Schultze-Delitsch to the meeting of the delegates of co-operative societies at Berlin gives a highly satisfactory account of the working of these associasions in general. Some mistakes have been made, and some failures have occurred in consequence. The Shawl-weavers' Society failed for want of the necessary commercial knowledge and aptitude of its members, and the associations formed for the supply of provisions have generally been beaten by the retail dealers. The great successes have been with the popular banks and financial associations for deposits, loans, and credits to working men; and the success of these is in a great measure due, perhaps, to the fact that they have not attempted more than was within their natural grasp; they have restrained themselves to the modest programme with which they set out, and have not attempted to rival the magnificent establishments of the great capitalists or speculators. An important step was taken not long ago in the formation of a central office, at which periodical meetings of delegates take place, when much useful information is exchanged between them. The following are the statistics furnished respecting these associations:—Last year their number amounted to about 1,500, the circulation of money by their means amounted to more than thirteen millions sterling, the capital employed to about four millions, of which one-fifth was the actual property of the societies; and the total number of members associated was 350,000, representing with their families a population of about a million and a-half. In 1859 the capital amounted to rather less than two pounds per head of the associated members, and last year it was exactly double that amount; in the former year the loans made to members reached only 808 francs per head, last year they attained to 1,495 francs per head. The capital and business of these associations have, therefore, been very nearly doubled in seven years.

Notes.

THE USE OF HORSE-FLESH IN PARIS.—The use of this kind of meat, in spite of very strong feelings against it, seems to be making its way. There are now seven special slaughter-houses in Paris, selling, says M. Decroix, a veterinary surgeon, 20,000 kilogrammes (20 tons) a week; and there are, furthermore, six establishments for the manufacture of sausages, which the same gentleman declares to be equal to those of Lyons, which have so high a reputation. There are three restaurants, at least, where no other kind of meat is employed; and the soup made from horse-beef is sold at rather more than twopence a quart. The slaughter-houses are under the supervision of an experienced veterinary surgeon, who inspects the animals before they are killed and the meat afterwards. The best beasts come from Normandy; they are mostly old, but if left to rest a few days before being killed the meat is said to be good both in appearance and quality. The inferior parts, which make as good soup as the dearer portions, cost only about two pence a pound wholesale. Horse-meat is now also in use in Nancy, and an establishment is about to be opened at Lyons. M. Decroix says that, instead of the flesh being extremely hard and indigestible, as some people assert, it is, on the contrary, more wholesome and more nourishing, though not quite so agreeable to the taste. In reference to the portable extract of soup which has been made from the refuse meat, M. Decroix says that he has prepared it in Algeria, where it was partaken off by the officers of his mess; that it contains all the nutritive qualities of the meat, but that the soup made from it is not agreeable unless it be boiled, with the addition of water, celery, or other vegetable, for some minutes. As regards the meat in general, he says, that horse-flesh is to that of bullocks what seconds bread is to fine bread, not quite so palatable but more sustaining.

THE TELEGRAPH BETWEEN SIBERIA AND AMERICA.—The American engineers, accompanied by an escort of natives, have travelled for sixty-four days in the wild regions of Tchouktchi. Since the voyage of Captain Behring these wild and barren regions, inhabited by savages, have not been visited. At the present time, the country between the village of Andyr, as far as the River Amoor, has all been explored, and the direction of the telegraphic line has been determined, and they are now waiting for the arrival of the ships belonging to the Telegraph Company, that are delayed by the ice in the Sea of Okhotsk. These ships are laden with the necessary stores and implements, and bring the workmen, who are natives of the province of Yakutsk, in order to commence immediately the works from the Amoor to Behring's Straits. In the meanwhile the employés of the company are constructing houses and preparing the telegraphic posts between Okhotsk and Andyr. Judging from the activity displayed by the principal agents of the company the construction of the telegraph between Siberia and America will not occupy more than three years. The travellers have to cross a desert of about 6,000 versts in sledges drawn by dogs, and in a temperature of 36° Reaumur below zero. They are obliged often to pass the night in the open air. Besides, it is impossible for them to take but a limited supply of provisions for themselves and their dogs.

Correspondence.

THE ELECTRIC TELEGRAPH.—SIR,—My attention has been called, by one of the most distinguished electricians of the day, to a letter which appeared in your *Journal* for the 2nd instant, signed "An Old Member," on the subject of "collecting, for the use of the nation, during the lifetime of the inventors, a complete series of the

telegraphic instruments which have been produced, and which have led to the production of the present simple and beautifully-effective instruments." Having already in this Museum specimens of nearly all the submarine electric cables which have been laid, and some of the instruments used by Brett, Dujardin, McCallum, and others, I beg, in the name of the Commissioners of Patents, to suggest that no more fitting place could be found for them than the Patent-office Museum, where they would be properly classified, and where every possible care would be taken of them, free of all charge to the contributors.—I am, &c., F. P. Smith, Curator.

Patent-office Museum, South Kensington, W., 9th November, 1866.

The Electric Telegraph.—Sir,—I expected to have seen in the *Journal* some notice of the letter from "An Old Member," which appeared November 2nd, for I think it should hardly be allowed to go forth on high authority that to Messrs. Cooke and Wheatstone "the whole credit of the first introduction of the electric telegraph into use is really due." Your correspondent, although he has mentioned many names honourably connected with electric science, has omitted that of Mr. Ronalds, who, more than twenty years before Messrs. Cooke and Wheatstone's first patent, erected and worked eight miles of electric telegraph. Mr. Ronalds, in 1816, brought his invention under the notice of Government, but was informed that telegraphs were "wholly unnecessary."—I am, &c., C. E. F.

MEETINGS FOR THE ENSUING WEEK.

Mon ...R. Asiatic, 3.
Entomological, 7.
Society of Engineers, 7. Discussion on Mr. Thomas Cargill's paper "On the Railway Bridge at La Place de l'Europe, Paris."
British Architects, 8.

Tues ...Anthropological, 8.
Statistical, 8. 1. Mr. Wm. Newmarch, F.R.S., "Review of Professor Rogers' History of Prices, A.D. 1259 to 1400." 2. Mr. R. D. Baxter, "On Railway Extension and its results."
Civil Engineers, 8. 1. Renewed discussion, "Steam-power on Canals." 2. Mr. J. L. Morgan, "Smelting Copper Ores in Australia."
Ethnological, 8. 1. Professor Huxley, "On the Skull of a Patagonian." 2. Dr. Mann, "On the Zulu and other Caffre tribes of Natal." 3. Mr. John Crawfurd, "On the ethnological results of the Arabian conquest of Spain."

Wed ...Society of Arts, 8. Opening Address by Sir Thomas Phillips, Q.C., Chairman of Council.
Geological, 8. 1. Rev. W. B. Clarke, "On marine fossiliferous deposits of secondary age in New South Wales." 2. Dr. P. Martin Duncan, "On the madreporaria of the infra-liassic beds of South Wales." 3. Mr. Henry Woodward, "On the structure of the *Limuloidæ*." 4. Mr. J. C. Hawkshaw, "Geological description of the First Cataract, Upper Egypt." 5. Dr. P. Martin Duncan, "On some Echinodermata from the cretaceous rocks of Sinai."

Patents.

From Commissioners of Patents' Journal, November 9th.

Grants of Provisional Protection.

Alkali—2749—J. C. Stevenson.
Bar iron—1780—W. E. Gedge.
Breech-loading fire-arms, and cartridges for—2743—T. Wilson.
Brooches—2731—J. Richards.
Carriages—2721—J. Day.
Carriages, brakes for—2775—L. Latter.
Cotton gins—2753—J. L. Davies.
Cut crops, lifting—2727—S. Pedder.
Fire-arms, breech-loading—2757—J. W. Roberton.
Gas and coke—2733—J. Greenshields.
Lamps—2769—N. H. Loomis.
Lighting and heating—2755—C. E. Brooman.
Lubricators—2763—J. Storer.
Markers' butts—2729—R. T. Williams.
Metals from minerals, extracting—2745—H. D. Plimsoll, J. R. Davies, and W. R. Dawson.
Percussion spinning tops—2765—C. D. Abel.
Piston-rods, metallic packings for—2741—J. Ogden.
Printing machines—2717—T. Horby.
Rails, capping—2767—G. F. L. Meakin.
Railways—2735—A. V. Newton.
Railway signals, working—2747—E. F. Piers.
Safety fuzes—2771—J. H. Gresham.
Salinometer pots—2725—A. V. Newton.
Steam dredgers—2723—A. C. Kirk.
Substances, preserving—2454—J. and A. Gamgee.
Sugar refining—2773—J. Wagener and G. J. Firmin.
Telegraph cables—2141—H. B. Wright.
Upholsterer's trimmings—2715—G. Dixon.

Patents Sealed.

1335. D. Sowden and R. C. Stephenson.
1336. G. and E. Ashworth.
1339. J. Cole and G. S. Melland.
1342. J. White.
1348. L. R. Bodmer.
1349. D. Nicoll.
1352. J. M. Hart.
1359. E. Brasier.
1368. T. J. Chapman and T. Rose.
1365. A. P. Price.
1382. W. Payton.
1390. E. and C. Price.
1413. P. Devilliard and A. Pestweiler.
1420. J. L. and J. K. Field.
1448. G. Haseltine.
1470. B. F. Weatherdon.
1490. R. and R. Maynard.

From Commissioners of Patents' Journal, November 13th.

Patents Sealed.

1380. J. Cheverton.
1387. J. S. Gisborne.
1388. F. Field.
1389. W. Curry.
1401. J. Bernard.
1405. D. J. Fleetwood.
1410. J. Bernard.
1435. P. J. Messent.
1438. G. W. Homer.
1471. J. D. Whelpley & J. J. Storer.
1492. J. D. Whelpley & J. J. Storer.
1493. J. D. Whelpley & J. J. Storer.
1506. H. Schofield.
1873. C. de Grelle.

Patents on which the Stamp Duty of £50 has been Paid.

2758. J. Townsend.
2764. W. E. Newton.
2768. R. Johnson.
2771. L. Braham.
2775. A. Barclay and A. Morton.
2799. J. Smith.
2829. W. Chambers.
2782. W. J. Cunningham and H. Connop.
2834. J. W. Drummond.
2800. W. R. Bowditch.
2840. H. Gladstone.
2837. T. Harrison.
2790. S. Faulkner.
2806. W. D. Richards.
2825. D. M. Fyfe.

Patents on which the Stamp Duty of £100 has been Paid.

2546. J. Hamer.
2543. G. Hadfield.
2615. S. Corbett.
2593. A. V. Newton.
2595. J. Graham.
2634. W. Prosser.

Registered Designs.

Fastener for Harness and other Straps and Bands—October 19—4818—J. B. Fenby and T. W. Jones, Birmingham.
Combined Scent and Portrait Locket—October 30—4821—J. W. Lewis, Birmingham.
Expanding Travelling Basket—October 31—4822—H. J. Cave and Sons, 1, Edward-street, Portman-square.
Framework for Lithographic, Zincographic, Typographic Printing Machinery—November 1—4823—C. H. Gardner, West Harding-street, Fetter lane.
Instrument to be fitted in Corks, to form therewith an Improved Stopper—November 14—4824—C. Bather, Roselands, Upper Walmer, Kent.

LIST OF PRESENTS.

The following Presents have been made to the Society during the past year. The thanks of he Society have been forwarded to the Donors :—

PRESENTS.	DONORS.
pecifications of Patents up to the present time, and Indexes	Commissioners of Patents.
bridgments of ditto	„
he Commissioners of Patents' Journal	„
ithograph likeness of the late F. A. Winsor, originator of public gas lighting	F. A. Winsor.
lust of H.R.H. the Prince of Wales, by Morton Edwards	Morton Edwards.
lectrical Communication in Railway Trains, &c., by A. E. Brae	Author.
he Acts concerning Inventions and Designs exhibited at the Dublin Exhibition, 1865, and Industrial Exhibitions generally, with an Appendix, by F. W. Campin, Barrister-at-Law	„
amblings in the elucidation of the Autograph of Milton, by Samuel Leigh Sotheby, F.S.A.	Mrs. Leigh Sotheby.
eports of the Juries, and Lists of their Awards, Dublin Exhibition, 1865	Executive Committee.
he Marshes of South Italy: A Few Words on Cotton Growing in Italy, &c., by J. Bailey Denton	Author.
ransactions of the Royal Society of Victoria, 1861-4	Society.
landbuch der Mechanischen Technologie. Von Karl Karmarsch	Author.
fficial Catalogue of the Italian Section, Dublin Exhibition, 1865	Commission.
he Magnetic Purification of River Water, &c., by Thomas Spencer, F.C.S.	Author.
holera Prospects, by Tilbury Fox, M.D.	„
n Telemeters, by the late A. Hamilton Bell, M.A.	Executor.
rt Directory of the Science and Art Department, revised to September, 1865	Department.
e Homes of the Working Classes, by James Hole	Author.
lections from Locke's Essay on the Human Understanding, with Introduction and Notes, by G. H. Emmens	„
e Utilisation of Sewage of Towns, and prevention of Pollution of Rivers, by Charles Forster Cotterill	„
the Extent and Aims of a National Museum of Natural History, by Professor Owen, F.R.S.	„
port on the Proposed Harbour of Refuge, New Basin, and Dock at Maryport, by Thomas Page, C.E.	„
r Colonial Empire and the case of New Zealand, by J. Busby	„
atistics of New Zealand for 1864	Colonial Secretary

PRESENTS.	DONORS.
Report of the Art Union of London, 1865	Art Union.
Catalogue of the Library of the Royal Institution of British Architects	Institution.
Jahrbücher des Vereins für Naturkunde im Herzogthum Nassau	The Society.
Harbour of Refuge and Docks at Newhaven, by Captain Julius Roberts	Author.
Rules of The Farmers' Club, 1866	Club.
Memorial Volume of the South London Working Classes Industrial Exhibition, 1865, compiled by G. M. Murphy	Author.
Psychoneurology; a Treatise on the Mental Faculties, by Robert Thomas Stothard	„
The Alkaline Permanganates and their Medicinal Uses, by John Muter	„
Treatise on Mathematical Drawing Instruments, by W. F. Stanley	„
Reports of the Inspectors of Factories for the half-year ending 31st October, 1865	A. Redgrave.
Report of Proceedings of 13th Annual Dinner of the London Association of Foremen Engineers	Association.
Paper read by Mr. Joseph Newton at the London Association of Foreman Engineers, "On Foremen and their Associations"	Association.
Catalogue of Reference Library, Manchester Free Library	Library.
Catalogue of the Library of the Royal United Service Institution, 1865	Institution.
Memoirs of the Geological Survey of India, Vol. iv. Part. 3, Vol. v. Part 1.	Geological Survey of India.
Annual Report of the Geological Survey of India, 1864-65.	„
Catalogue of the Organic Remains Belonging to the Echinodermata.	„
Palæontologia Indica iii. 6—9, iv. 1	„
Le Specie dei Cotoni descritte da Filippo Parlatore.	Prof. Parlatore.
Fires, Fire Engines, and Fire Brigades, by C. F. T. Young, C.E.	Author.
The Currency Difficulty Solved, by A. Alison	„
Report on the Cattle Plague from June, 1865, to March 30, 1866	Cattle Plague Enquiry.
A Practical Treatise upon Preventing Accidents in Coal Mines, by Matthias Dunn	Author.
An Enquiry into certain Principles of Architectural Physiology, by Dr. D. O. Edwards	„
Translation of the City of Paris Budget, 1866	Metropolitan Board of Works.
Cuneiform Inscriptions of Western Asia, II. folio	Trustees of the British Museum.

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Practical Treatise on Banking, by J. W. Gilbart, F.R.S. 2 vols.....	Presentation series by the executors of the author.
Logic of Banking, by J. W. Gilbart, F.R.S.	"
History and Principles of Banking, by J. W. Gilbart, F.R.S.	"
Lectures and Essays, by J. W. Gilbart, F.R.S.	"
Logic for the Million, by J. W. Gilbart, F.R.S.	"
Transactions of the Linnæan Society, Vol. xxv., Part II.	Society.
Transactions of the Society of Engineers, 1865	"
Census Report of Calcutta, 1866....	A. M. Dowleans.
Fire Prevention and Fire Extinction, by James Braidwood	Mrs. Braidwood.
Transactions of the Zoological Society of London, Vol. v., Part 5	Society.
Proceedings of the Zoological Society of London, 1865, Parts 1, 2, 3....	"
Minutes of Proceedings of the Institution of Civil Engineers, 1862-3, 1863-4, 1864-5, and 1865-6	Institution.
Library Catalogue of the Institution of Civil Engineers	"
Proceedings of the Literary and Philosophical Society of Manchester. Vols. iii. and iv.	Society.
Memoirs of the Literary and Philosophical Society of Manchester, Vol. ii. 3rd series	"
Report of the Meeting of the British Association for the Advancement of Science, Birmingham, 1865 ..	Association.
Elements of Animal Physiology, by John Angell	Author.
Second Report upon the River Waimakariri and the Lower Plains of Canterbury, New Zealand, by W. T. Doyne	Author.
Memoirs of the Royal Astronomical Society, Vols. xxv.—xxix.	Society.
On the Future Water Supply of London, by G. W. Hemans, C.E., and R. Hassard, C.E.	Authors.
The Twenty-second Annual Report of the Society for Improving the Condition of the Labouring Classes, 1865-6	Society.
Reports of the Inspectors of Factories for the half-year ending 30th April, 1866	Alex. Redgrave.
Facts and Figures Relative to Submarine Telegraphy as a Branch of Commercial Enterprise, by John Macintosh, C.E.	Author.
On the Application of Disinfectants in Arresting the Spread of the Cattle Plague, by W. Crookes, F.R.S.	"
Statement Presented by the Prefect of the Seine to the Municipal Council of Paris, Session 1865 ..	Metropolitan Board of Works
United States Sanitary Commission. Bulletin 1863-5	Commission.
Documents of United States Sanitary Commission. Vols. i. and ii.	"
Smithsonian Report, 1864	Institution.
Thirty-ninth Annual Report of the President of Harvard College, 1863—64	Harvard College.
Annual Reports of the President and Treasurer of Harvard College, 1864—5	"

Presents.	Donors.
Report of the Visiting Committee of Overseers of Harvard College, 1864	Harvard College.
Annual Report of the Librarian of Harvard College, 1864	"
Annual Report of the Trustees of the Museum of Comparative Zoology at Harvard College, 1864........	"
Do. Do. 1865........	"
Proceedings of the American Philosophical Society, Vol. x. 75......	Society.
Catalogue of the Library of American Philosophical Society, Part II.	"
On the Strength of Cast Iron Pillars, by J. B. Francis, C.E., New York	Author.
Reale Instituto Lombardo di Scienze e Lettere. Rendiconto. Classe di Lettere e Scienze Morali e Politiche. Vol. ii. Parts 3-7	Institute.
Memorie Do. Vol. x., 1 della serie III.	"
Memorie Do. Classe di Scienze Mathematiche e Naturali. Vol. 2. Part 3-8	"
Memorie Do. Vol. x., 1 della serie III.	"
Transactions of the Historic Society of Lancashire and Cheshire. Vol. xvii., 1864-5	Society.
The Electric Telegraph: Was it Invented by Professor Wheatstone? by W. Fothergill Cooke. 2 vols...	Author.
Lands of Tasmania, compiled from the Official Records of the Survey Department, by order of the Honourable the Colonial Treasurer, December, 1864, by J. E. Calder	"
Historical Data, chiefly relating to South Lancashire and the Cotton Manufacture, by Henry Ashworth	"
A Dictionary of Chemistry, by Henry Watts, B.A., F.R.S. (parts in continuation)	"
Journal of the Royal Agricultural Society of England, Vol. ii. (new series)	Society.
Proceedings of the Royal Institution of Great Britain	Institution.
The American Journal of Science and Art, by Messrs. Silliman and Dana	Editors.
Transactions of the Royal Scottish Society of Arts, 1865	Society.
Journal of the Royal Geological Society of Ireland, 1865-6	"
Proceedings of the Royal Society of Edinburgh, 1864-5	"
Transactions of the Royal Society of Edinburgh, 1864-65	"
Proceedings of the Royal Society 1865—6	"
Proceedings of the Institution of Mechanical Engineers, 1866	Institution.
Proceedings of the Royal Geographical Society, 1865-6	Society.
Journal of the Royal Asiatic Society. Vol. ii. Part I.	"
Table showing the Increase in the Rateable Annual Value of the Property in the Metropolitan Area from 1856 to the present time	Metropolitan Board of Works
The Early History of Brass, and the Brass Manufactures of Birmingham, by W. C. Aitken.........	Author.

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The Council beg to acknowledge, with thanks to the Proprietors, the regular receipt of the following Journals and Periodicals:—

WEEKLY.

Agricultural Review.
Athenæum.
British Journal of Photography.
Builder.
Building News.
Chemical News.
Cosmos.
Engineer.
Engineering.
English Mechanic.
Farmer.
Gardeners' Chronicle.
Herapath's Railway and Commercial Journal.
Les Mondes.
London Review.
Mechanics' Magazine.
Mining Journal.
North British Agriculturist.
Photographic News.
Reader.
Social Science Review.

FORTNIGHTLY.

Canadian News.
Cotton Supply Reporter.

MONTHLY.

Artizan.
Art Journal.
Bulletin de la Société d'Encouragement pour l'Industrie Nationale.
Bulletin du Musée de l'Industrie.
Canadian Naturalist and Geologist.
Civil Engineer and Architects' Journal.
Educational Times.
Engineers' Journal (Calcutta).
Intellectual Observer.
Journal of the Chemical Society.
Journal of the Board of Arts and Manufactures for Upper Canada.
Journal of the Franklin Institute.
Journal of the Horticultural Society.
Journal of the National Life Boat Institution.
Journal of the Pharmaceutical Society.
Newton's London Journal of the Arts and Sciences.
Photographic Journal.
Practical Mechanics' Journal.
Presse Scientifique des Deux Mondes.
Revue du Monde Colonial.
The Horological Journal.

QUARTERLY.

Journal of Mental Science.
Journal of the Geological Society.
Journal of the Linnæan Society.
Journal of the Royal United Service Institution.
Journal of Science.
Journal of the Statistical Society.
Popular Science Review.

INDEX TO VOLUME XIV.

* *disc.*, discussion at a meeting.

J.

K.

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M.

S.

T.

U.

V.

ERRATA.

Page 87, col. 2, line 29, *for* "would," read "could," twice in same line; line 30, *for* "constantly," read "consequently;" line 43, *for* "bow," read "stern;" line 48, ditto; line 55, *for* "in advance," read "a-stern;" line 59, *for* "bow," read "stern;" line 61, ditto; page 88, col. 1, line 40, *for* "worn," read "nearer;" line 52, *for* "least," read "last;" col. 2, line 43, *for* "providing," read "provided;" line 44, *for* "a-head," read "a-stern;" line 45, *for* "descends," read "depends;" *for* "bow," read "stern;" line 57, take out comma after "to take place."